DATA VALIDATION REPORT
2012 REMEDIAL INVESTIGATION/FEASIBILITY STUDY

OPERABLE UNIT 2
JUNE 2012 SURFACE WATER/ SEDIMENT SAMPLING EVENT

OLIN CHEMICAL SUPERFUND SITE
51 EAMES STREET
WILMINGTON, MASSACHUSETTS

Submitted to:

Olin Corporation
3855 North Ocoee Street, Suite 200
Cleveland, TN 37312

Prepared by:

AMEC Environment & Infrastructure, Inc.
107 Audubon Road
Wakefield, Massachusetts 01880

November 6, 2012

AMEC Project Number: 6107120016.01.10

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Peter H. Thompson
with permission for Project Manager

Michael J. Murphy
Project Principal

with permission for Christian S. Ricardi
Quality Assurance Officer

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LIST OF ACRONYMS

APHA	American Public Health Association
AMEC	AMEC Environment & Infrastructure, Inc.
DMF	N,N-Dimethylformamide
EDD	Electronic Data Deliverable
GC/NPD	Gas Chromatograph/Nitrogen-Phosphorous Detector
HPLC	High Performance Liquid Chromatography
HT	Holding Time
J	Estimated value
LC/MS/MS	Liquid Chromatography/Dual Mass Spectrometry
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MACTEC	MACTEC Engineering and Consulting, Inc.
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MMH	Monomethylhydrazine
MS/MSD	Matrix Spikes/Matrix Spike Duplicate
µg/L	Microgram per liter
ND	Non-detect
NDMA	N-nitrosodimethylamine
PE	Performance Evaluation
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TIC	Tentatively Identified Compound
TOC	Total Organic Carbon
TSS	Total Suspended Solids

U	Not detected
UDMH	Unsymmetrical Dimethylhydrazine
UJ	Not detected estimated
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

One surface water and sediment location was sampled at the Olin Chemical Superfund Site in June 2012 as specified in the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (MACTEC Engineering and Consulting, Inc. [MACTEC], 2009, now AMEC Environment & Infrastructure, Inc.). Samples were analyzed by one or more of the following United States Environmental Protection Agency (USEPA) SW-846 (USEPA, 1996a), USEPA wastewater (USEPA, 1993), Standard Methods American Public Health Association ([APHA], 1995) or laboratory developed methods:

Laboratory	Parameter	Analytical Method	Validation Level
TestAmerica - Westfield, MA	Volatile Organic Compounds (VOCs)	SW-846 8260C	Olin Level 1
TestAmerica - Westfield, MA	Semivolatile Organic Compounds (SVOCs)	SW-846 8270D – Low Level	Olin Level 1
TestAmerica - Westfield, MA	Diphenylamine (sediment only)	SW-846 8270D – Low Level	Olin Level 1
TestAmerica - West Sacramento, CA	N-Nitrosodimethylamine (NDMA) & N-nitroso-di-n-propylamine	Modified 521	Olin Level I
TestAmerica - Westfield, MA	TAL Metals plus tin	SW-846 6010C/Hg by 7470A	Olin Level 1
TestAmerica – Irvine, CA	Metals (copper, lead, silver)	SW-846 6020A	Olin Level 1
TestAmerica - Westfield, MA	Ammonia	QuickChem: LACHAT 10-107-06-1-B	Olin Level 1
TestAmerica - Westfield, MA	Anions (chloride, sulfate, nitrate, nitrite, bromide)	EPA 300.0	Olin Level 1
TestAmerica - Tallahassee, FL	Formaldehyde / Acetaldehyde	SW-846 8315A	Chemist Review
TestAmerica - Tallahassee, FL	Phthalic Anhydride	Lab Specific TAL-TALL LC65	Chemist Review
TestAmerica - Westfield, MA	Total Organic Carbon (TOC)	Lloyd Kahn	Chemist Review
TestAmerica - Westfield, MA	Hardness	SM 2340B	Chemist Review
TestAmerica - Westfield, MA	Total Suspended Solids (TSS)	SM 2540D	Chemist Review
Katahdin Analytical Services - Scarborough, ME	N,N-dimethylformamide	Modified 8033 - GC/NPD	Chemist Review
Lancaster Laboratory - Lancaster, PA	Hydrazine / MMH / UDMH	Modified 8315 LC/MS/MS	Chemist Review
Lancaster Laboratory - Lancaster, PA	Opex and Kempore	Lab Specific HPLC Method 8000B	Chemist Review

A summary of samples (by sample delivery group [SDG]) included in this data validation report is presented in Table 1. Analytical data packages were reviewed in accordance with the Olin Chemical Superfund Site Final RI/FS Work Plan Quality Assurance Project Plan (QAPP) [MACTEC, 2009]. Volatile organic compounds (VOCs), semivolatile organic compounds (SVOC), and metals data were validated using the Region I EPA-New England Data Validation Functional Guidelines (USEPA, 1996b) and the Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) (MassDEP, 2010). USEPA Region I data validation procedures for SW-846 Methods were modified to include method-specific criteria (i.e., measurement performance criteria detailed in the QAPP) from the MCP Methods. For other methods that were not addressed in USEPA Region I guidelines or the MCP Compendium, method performance criteria were developed for this project. Validation levels for each method (Olin Level 1, chemist review) are summarized above.

Final validated sample results are presented in Table 2. Documentation of data validation actions is presented in Table 3. Tables 3 includes final results that have been qualified (data validation has resulted in revisions to the laboratory result) as well as the associated validation reason codes. An index of the reason codes is presented on the last page of Table 3.

Tentatively identified compounds (TICs) were reported by the laboratory, if detected, in samples analyzed for VOCs and SVOCs. TICs were evaluated during validation and were removed from the data set if reported in associated method blanks. SVOC TICs, discussed in Section 3, are presented by SDG in Table 4.

Performance evaluation (PE) samples were submitted to the laboratory during previous rounds of RI groundwater sampling. No PE samples were submitted with this round of sampling.

N-nitrosodi-n-propylamine was included as a SVOC target compound in Method 8270D and the low detection limit analysis by modified USEPA Method 521 for surface water. Both sets of data were reported by the laboratory. The Method 521 data had lower reporting limits when compared to the SVOC method. For N-nitrosodi-n-propylamine the Method 521 analyses were used for reporting final results, and the Method 8270D results for N-nitrosodi-n-propylamine were removed from the final data set.

2.0 VOLATILE ORGANIC COMPOUNDS

Samples were analyzed for VOCs by Method 8260C. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time (HT) and Preservation
* Blanks
  Laboratory Control Sample (LCS)
* Surrogate Recovery
* Detection Limits
* Sample Result Verification / Electronic Data Deliverable (EDD)
* TICs
* Results Reporting

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory.

2.1 Laboratory Control Samples

The sample results were qualified due to due to LCS and/or laboratory control sample duplicate (LCSD) percent recoveries that were outside project quality control (QC) goals of 40-160 (for select compounds) and LCS/LCSD relative percent difference (RPD) that was outside laboratory QC goals of 20. Qualified results are summarized on Table 3 with a reason code LCS-L or LCS-RPD.

Surface Water

The LCS/LCSD RPD of 1,2,3-trichloropropane (22) was outside of the QC limits. 1,2,3-trichloropropane was not detected in the associated sample and the reporting limits were qualified as estimated (UJ).

Sediment

The LCS/LCSD percent recoveries of acetone (36 and 37) were outside of the QC limits. Acetone was not detected in the associated samples and the reporting limits were qualified as estimated (UJ).

3.0 SEMIVOLATILE ORGANIC COMPOUNDS

Samples were analyzed for SVOCs by Method 8270D (low level method). A subset of samples was also analyzed for N-nitrosodimethylamine (NDMA) by modified Method 8270. Data validation actions for both methods are reported in this section. Additional analyses for diphenylamine were requested for sediment SVOC samples. The routine SVOC method cannot distinguish between diphenylamine and N-nitrosodiphenylamine and all results for both compounds are reported as N-nitrosodiphenylamine in Method 8270D. Clean up procedures described in the QAPP were requested at the time of sample collection. The lab was instructed to perform the cleanup and report separate results for the two compounds if N-nitrosodiphenylamine was detected. No samples had detections of N-nitrosodiphenylamine, and diphenylamine is reported as non-detect (ND).

Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time and Preservation
  Blanks
  Laboratory Control Sample
* Surrogate Recovery
  Detection Limits
* Sample Result Verification / EDD
  TICs
  Result Reporting

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory.

3.1 Blanks

Various compounds and various compounds reported as TICs were detected at low concentrations in method blanks. Sample results were qualified in accordance with the USEPA Region I guidelines. A summary of method blank qualification actions is presented in Table 3 for SVOCs with results being assigned a validation qualifier reason code of BL1. Detailed discussions of qualification action are presented in the following sections.

<u>Surface Water</u>

Acetophenone (0.67 micrograms per liter [µg/L]) and di-n-butyl phthalate (1.16 µg/L) were reported in the method blank. Action levels were established at five times the reported blank concentration for acetophenone and at ten times the reported blank concentration for di-n-butyl phthalate. Acetophenone was not detected in the associated sample, and no action was

necessary. Di-n-butyl phthalate was detected at less than the action levels and less than the reporting limits and was qualified not detected (U) at the reporting limit.

Sediment

Bis(2-ethylhexl) phthalate (16.5 micrograms per kilogram [µg/kg]) and di-n-butyl phthalate (185 µg/kg) were reported in the method blank. Action levels were established at ten times the reported blank concentration for bis(2-ethylhexl) phthalate and di-n-butyl phthalate. Associated sample detections of bis(2-ethylhexl) phthalate and di-n-butyl phthalate that were less than the action levels and less than the reporting limits were qualified not detected (U) at the reporting limits.

TICs reported in the sample were compared to TICs reported in associated method blanks. TICs that were reported in method blanks and in the associated sample were rejected and not reported in the final data.

3.2 Laboratory Control Samples

A subset of sample results was qualified due to LCS and/or LCSD that were outside project QC goals. Qualified results are summarized on Table 3 with reason codes LCS-L or LCS-H.

Surface Water

The following compounds had percent recoveries that were outside the control limits in the LCS/LCSD: aniline (39) and caprolactam (33 and 32). Aniline and caprolactam were not detected in the associated sample and the reporting limits were qualified estimated (UJ).

Sediment

The following compounds had percent recoveries that were outside of control limits in the LCS/LCSD: 2,4,4-trichlorophenol (138), 2,4,6-trichlorophenol (141), 3&4 methylphenol (133), aniline (38), benzo(a)anthracene (142), benzo(b)fluoranthene (152), carbazole (152), di-n-butyl phthalate (191 and 159) and fluoranthene (153). 2,4,4-trichlorophenol, 2,4,6-trichlorophenol, 3&4 methylphenol, carbazole, and di-n-butyl phthalate were not detected in the associated sample and no qualification was required. Results for aniline, benzo(a)anthracene, benzo(b)fluoranthene and fluoranthene were qualified estimated (J/UJ) in the associated sample.

3.3 Tentatively Identified Compounds

Tentatively Identified Compounds (TICs) reported in the sample were evaluated by the project chemist. TICs reported in QC blanks and those identified as common lab contaminants in the validation guidelines were removed from the final TIC data summary (Table 4).

3.4 Result Reporting

Surface Water

N-nitrosodi-n-propylamine was analyzed using both the 8270D and modified 521 methods. N-nitrosodi-n-propylamine was not detected in either method and results from the modified 521 with lower reporting limits were reported in the final data set.

Sediment

Field sample OC-SD-EDSD/SW7-XXX was extracted at a 20-fold dilution due to unknown hydrocarbons. Reporting limits for target compounds in this sample were elevated due to the dilution.

4.0 N-NITROSODIMETHYLAMINE & N-NITROSODI-N-PROPYLAMINE

Samples were analyzed for NDMA and N-nitrosodi-n-propylamine by modified USEPA Method 521 Modified (TAL method WS-MS-0012). Data were evaluated based on the following parameters:

* Data Completeness
* HT and Preservation
* Blanks
* Laboratory Control Sample
* Internal Standard Response
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Results are interpreted to be usable as reported by the laboratory.

5.0 TARGET ANALYTE LIST METALS (INCLUDING MERCURY)

Samples were analyzed for Target Analyte List (TAL) metals (plus tin) by SW-846 Method 6010C and Method 6020A (copper, lead and silver), and mercury by SW-846 Method 7470A. Data were reviewed for the following parameters:

* Data Completeness
* HT and Sample Preservation
  Blanks
* Laboratory Control Sample
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory.

5.1 Blanks

The laboratory qualified sample results associated with method blank detections with a B. After review of the method blanks, the B qualifiers were removed.

Surface Water

Iron (21.6 µg/L), manganese (1.31 µg/L), and potassium (498 µg/L) were detected in the method blank. Action levels were established at five times the concentration reported in the method blank and compared to sample results. Sample results were above the action levels; no action is required.

Sediment

Calcium (7.66 milligram per kilogram [mg/kg]), iron (2.6 mg/kg), magnesium (2.01 mg/kg), and tin (6.45 mg/kg) were detected in the method blank. Action levels were established at five times the concentration reported in the method blank and compared to sample results. Low concentration detections below the reporting limit and below the action level of the elements listed above were qualified not detected (U) at the reporting limit. A summary of method blank qualification actions is presented in Table 3 with results being assigned a validation qualifier reason code of BL1.

6.0 GENERAL CHEMISTRY (ANIONS, AMMONIA, TOC, HARDNESS, TSS)

An Olin Level 1 validation was performed on the data. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample
* Matrix Spike Analysis
* Laboratory Duplicate Analysis
* Field Duplicates
  Detection Limits
* Sample Result Verification / EDD

***** = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory.

6.1 Detection Limits

Sample OC-SW-EDSD/SW7-XXX was analyzed at a dilution due elevated concentrations of target analytes and/or matrix issues. Nitrite as N was reported as not detected at an elevated reporting limit.

7.0 FORMALDEHYDE/ACETALDEHYDE

Samples were analyzed for formaldehyde and acetaldehyde by SW-846 Method 8315. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample
  Matrix Spike Analysis
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory.

7.1 Matrix Spike Analysis

Sediment

Sample OC-SD-EDSD/SW7-XXX was submitted for Matrix Spikes/Matrix Spikes Duplicate (MS/MSD) analysis. The MS and MSD percent recoveries of acetaldehyde were outside of QC limits. Acetaldehyde was not detected in sample OC-SD-EDSD/SW7-XXX and the reporting limits were qualified as estimated (UJ).

8.0 PHTHALIC ANHYDRIDE

Samples were analyzed for phthalic anhydride by a laboratory specific modified method 8000 – High Performance Liquid Chromatography (HPLC) (TestAmerica – Tallahassee: method LC65). A chemist review was performed on the phthalic anhydride data set. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time and Preservation
* Blanks
* Laboratory Control Sample
* Matrix Spike Analysis
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Results are interpreted to be usable as reported by the laboratory.

9.0 HYDRAZINE, MONOMETHYLHYDRAZINE, UNSYMMETRICAL DIMETHYLHYDRAZINE

Samples were analyzed for hydrazine, monomethylhydrazine (MMH), and unsymmetrical dimethylhydrazine (UDMH) by a modified SW-846 Method 8315A LC/MS/MS. Reporting limits were hydrazine (2 µg/kg), MMH (5 µg/kg), and UDMH (5 µg/kg) for solid samples. Data were evaluated based on the following parameters:

* Data Completeness
* Holding Time and Sample Preservation
* Blanks
* Laboratory Control Sample
  Matrix Spike Analysis
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Results are interpreted to be usable as reported by the laboratory.

9.1 Matrix Spike Analysis

Sediment

Sample OC-SD-EDSD/SW7-XXX was submitted for MS/MSD analysis. The MS and MSD percent recoveries of MMH and UDMH were outside of QC limits. Recoveries of MMH (6 percent) and UDMH (14 and 16 percent) were low. These compounds were not detected in sample OC-SD-EDSD/SW7-XXX. Professional judgment was used not to qualify the reporting limits of MMH and UDMH based on LCS/LCSD percent recoveries being within QC standards and the known instability of hydrazine compounds in some media.

10.0 N, N-DIMETHYLFORMAMIDE

Samples were analyzed for N,N-Dimethylformamide (DMF) by a modified SW-846 Method 8033 gas chromatograph/nitrogen-phosphorous detector (GC/NPD). Reporting limits were 20 µg/L for aqueous samples. Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample
* Surrogate Recovery
* Detection Limits
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

The results are interpreted to be usable as reported by the laboratory.

11.0 OPEX AND KEMPORE

Samples were analyzed for Opex and Kempore by modified Method 8000B – HPLC (Lancaster Laboratory – Lancaster, Pennsylvania: Determination of Dinitrosopentamethylenetetramine (Opex) in Water, and Determination of Azodicarbonamide (Kempore) in Water). A chemist review was performed on the Opex and Kempore data sets. Data were reviewed for the following parameters:

* Data Completeness
  HT and Preservation
* Blanks
* Laboratory Control Sample
* Detection Limits
* Compound Identification
* Sample Result Verification / EDD

* = indicates that criteria were met for this parameter

Except for the validation actions noted below, the results are interpreted to be usable as reported by the laboratory.

11.1 Holding Time and Sample Preservation

Surface Water

Samples were collected on 6/18/12 and analyzed on 6/27/12. Holding time was exceeded by two days. Kempore was not detected in sample OC-SW-EDSD/SW7-XXX and the reporting limits were qualified estimated (UJ).

12.0 REFERENCES

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW., Washington, D.C. 2005.

MACTEC Engineering and Consulting, Inc. (MACTEC), 2009. "Final Remedial Investigation/Feasibility Study Project Operations Plan"; Volume III-B Quality Assurance Project Plan; Olin Chemical Superfund Site; 51 Eames Street; Wilmington, MA; August 14, 2009.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

United States Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

USEPA, 1996a. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 - December 1996.

USEPA, 1996b. "Region 1 EPA-NE Data Validation Guidelines for Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996.

Data validation was completed by project chemists:

- Michael Washburn

TABLES

Table 1
Sample Summary
Data Validation Report
Operable Unit 2 June 2012 Surface Water and Sediment Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sample Location	Field Sample ID	Date Sampled	TestAmerica Sample ID	SW8260C VOCs	SW8270D SVOCs	WS-MS-0012 NDMA	SW6010 Metals Total	SW6020 Metals Total	SW7470A/ SW7471A Mercury Total	E300 Anions
EDSD/SW7	OC-SW-EDSD/SW7-XXX	6/18/2012	360-41200-1	77	71	2	20	3	1	5
EDSD/SW7	OC-SD-EDSD/SW7-XXX	6/18/2012	360-41203-1	77	80		23		1	5

Sample Location	Field Sample ID	Date Sampled	TestAmerica Sample ID	E350.1 (QuickChem 10-107-06-1-B) Ammonia	LC65 Phthalic Anhydride	SW8315 Formaldehyde/ Acetaldehyde	A2340B Hardness	A2540D TSS	Lloyd Kahn/ A5310_TOC_B TOC	E160.3 Percent Solid
EDSD/SW7	OC-SW-EDSD/SW7-XXX	6/18/2012	360-41200-1	1			1	1	1	
EDSD/SW7	OC-SD-EDSD/SW7-XXX	6/18/2012	360-41203-1	1	1	2			1	2

Sample Location	Field Sample ID	Date Sampled	Lancaster Sample ID	SW8000B Opex / Kempore	SW8315A MOD Hydrazine	Katahdin Sample ID	SW8033M DMF
EDSD/SW7	OC-SW-EDSD/SW7-XXX	6/18/2012	1316839	2	--		
EDSD/SW7	OC-SD-EDSD/SW7-XXX	6/18/2012	1317239	--	3	SF3645-1	1

Notes:
Number listed under method indicates the number of target analytes reported.

Prepared by / Date: KJC 08/08/12
Checked by / Date: MJW 10/01/12

Table 2 - Sediment Results
Final Results Summary
Data Validation Report
Operable Unit 2 June 2012 Surface Water and Sediment Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SD-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41203-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8260C	1,1,1,2-Tetrachloroethane	ug/kg	2.5	U
N	SW8260C	1,1,1-Trichloroethane	ug/kg	2.5	U
N	SW8260C	1,1,2,2-Tetrachloroethane	ug/kg	2.5	U
N	SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	13	U
N	SW8260C	1,1,2-Trichloroethane	ug/kg	2.5	U
N	SW8260C	1,1-Dichloroethane	ug/kg	2.5	U
N	SW8260C	1,1-Dichloroethene	ug/kg	2.5	U
N	SW8260C	1,1-Dichloropropene	ug/kg	2.5	U
N	SW8260C	1,2,3-Trichlorobenzene	ug/kg	2.5	U
N	SW8260C	1,2,3-Trichloropropane	ug/kg	2.5	U
N	SW8260C	1,2,4-Trichlorobenzene	ug/kg	2.5	U
N	SW8260C	1,2,4-Trimethylbenzene	ug/kg	2.5	U
N	SW8260C	1,2-Dibromo-3-chloropropane	ug/kg	25	U
N	SW8260C	1,2-Dibromoethane	ug/kg	2.5	U
N	SW8260C	1,2-Dichlorobenzene	ug/kg	2.5	U
N	SW8260C	1,2-Dichloroethane	ug/kg	2.5	U
N	SW8260C	1,2-Dichloropropane	ug/kg	2.5	U
N	SW8260C	1,3,5-Trimethylbenzene	ug/kg	2.5	U
N	SW8260C	1,3-Dichlorobenzene	ug/kg	2.5	U
N	SW8260C	1,3-Dichloropropane	ug/kg	2.5	U
N	SW8260C	1,4-Dichlorobenzene	ug/kg	2.5	U
N	SW8260C	1,4-Dioxane	ug/kg	250	U
N	SW8260C	2,2-Dichloropropane	ug/kg	2.5	U
N	SW8260C	2,4,4-Trimethyl-1-pentene	ug/kg	5	U
N	SW8260C	2,4,4-Trimethyl-2-pentene	ug/kg	5	U
N	SW8260C	2-Butanone	ug/kg	25	U
N	SW8260C	2-Chlorotoluene	ug/kg	2.5	U
N	SW8260C	2-Hexanone	ug/kg	25	U
N	SW8260C	4-Chlorotoluene	ug/kg	2.5	U
N	SW8260C	4-iso-Propyltoluene	ug/kg	2.5	U
N	SW8260C	4-Methyl-2-pentanone	ug/kg	25	U
N	SW8260C	Acetic acid, methyl ester	ug/kg	50	U
N	SW8260C	Acetone	ug/kg	250	UJ
N	SW8260C	Benzene	ug/kg	2.5	U
N	SW8260C	Bromobenzene	ug/kg	2.5	U
N	SW8260C	Bromochloromethane	ug/kg	2.5	U
N	SW8260C	Bromodichloromethane	ug/kg	2.5	U
N	SW8260C	Bromoform	ug/kg	2.5	U
N	SW8260C	Bromomethane	ug/kg	5	U
N	SW8260C	Butane, 2-methoxy-2-methyl-	ug/kg	2.5	U
N	SW8260C	Carbon disulfide	ug/kg	2.5	U
N	SW8260C	Carbon tetrachloride	ug/kg	2.5	U
N	SW8260C	Chlorobenzene	ug/kg	2.5	U
N	SW8260C	Chlorodibromomethane	ug/kg	2.5	U
N	SW8260C	Chloroethane	ug/kg	5	U
N	SW8260C	Chloroform	ug/kg	2.5	U
N	SW8260C	Chloromethane	ug/kg	5	U
N	SW8260C	Cis-1,2-Dichloroethene	ug/kg	2.5	U
N	SW8260C	cis-1,3-Dichloropropene	ug/kg	2.5	U
N	SW8260C	Cyclohexane	ug/kg	25	U
N	SW8260C	Dibromomethane	ug/kg	2.5	U
N	SW8260C	Dichlorodifluoromethane	ug/kg	5	U
N	SW8260C	Diethyl ether	ug/kg	2.5	U
N	SW8260C	Ethyl benzene	ug/kg	2.5	U
N	SW8260C	Ethyl-t-Butyl Ether	ug/kg	2.5	U
N	SW8260C	Hexachlorobutadiene	ug/kg	2.5	U
N	SW8260C	Isopropyl ether	ug/kg	2.5	U
N	SW8260C	Isopropylbenzene	ug/kg	2.5	U
N	SW8260C	Methyl cyclohexane	ug/kg	2.5	U
N	SW8260C	Methyl Tertbutyl Ether	ug/kg	2.5	U
N	SW8260C	Methylene chloride	ug/kg	10	U
N	SW8260C	n-Butylbenzene	ug/kg	2.5	U
N	SW8260C	Naphthalene	ug/kg	25	U
N	SW8260C	Propylbenzene	ug/kg	2.5	U
N	SW8260C	sec-Butylbenzene	ug/kg	2.5	U
N	SW8260C	Styrene	ug/kg	2.5	U

Table 2 - Sediment Results
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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SD-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41203-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8260C	tert-Butylbenzene	ug/kg	2.5	U
N	SW8260C	Tetrachloroethene	ug/kg	2.5	U
N	SW8260C	Tetrahydrofuran	ug/kg	50	U
N	SW8260C	Toluene	ug/kg	2.5	U
N	SW8260C	trans-1,2-Dichloroethene	ug/kg	2.5	U
N	SW8260C	trans-1,3-Dichloropropene	ug/kg	2.5	U
N	SW8260C	Trichloroethene	ug/kg	2.5	U
N	SW8260C	Trichlorofluoromethane	ug/kg	5	U
N	SW8260C	Vinyl chloride	ug/kg	2.5	U
N	SW8260C	Xylene, o	ug/kg	2.5	U
N	SW8260C	Xylenes (m&p)	ug/kg	5	U
N	SW8270	1,2,4,5-Tetrachlorobenzene	ug/kg	600	U
N	SW8270	1,2,4-Trichlorobenzene	ug/kg	600	U
N	SW8270	1,2-Dichlorobenzene	ug/kg	600	U
N	SW8270	1,3-Dichlorobenzene	ug/kg	600	U
N	SW8270	1,4-Dichlorobenzene	ug/kg	600	U
N	SW8270	1-Methylnaphthalene	ug/kg	600	U
N	SW8270	2,3,4,6-Tetrachlorophenol	ug/kg	600	U
N	SW8270	2,4,5-Trichlorophenol	ug/kg	600	U
N	SW8270	2,4,6-Trichlorophenol	ug/kg	600	U
N	SW8270	2,4-Dichlorophenol	ug/kg	600	U
N	SW8270	2,4-Dimethylphenol	ug/kg	600	U
N	SW8270	2,4-Dinitrophenol	ug/kg	600	U
N	SW8270	2,4-Dinitrotoluene	ug/kg	600	U
N	SW8270	2,6-Dinitrotoluene	ug/kg	600	U
N	SW8270	2-Chloronaphthalene	ug/kg	600	U
N	SW8270	2-Chlorophenol	ug/kg	600	U
N	SW8270	2-Methylnaphthalene	ug/kg	600	U
N	SW8270	2-Methylphenol	ug/kg	600	U
N	SW8270	2-Nitroaniline	ug/kg	3000	U
N	SW8270	2-Nitrophenol	ug/kg	600	U
N	SW8270	3 & 4 Methylphenol	ug/kg	600	U
N	SW8270	3,3`-Dichlorobenzidine	ug/kg	1200	U
N	SW8270	3-Nitroaniline	ug/kg	3000	U
N	SW8270	4,6-Dinitro-2-methylphenol	ug/kg	3000	U
N	SW8270	4-Bromophenyl phenyl ether	ug/kg	600	U
N	SW8270	4-Chloro-3-methylphenol	ug/kg	1200	U
N	SW8270	4-Chloroaniline	ug/kg	1200	U
N	SW8270	4-Chlorophenyl phenyl ether	ug/kg	600	U
N	SW8270	4-Nitroaniline	ug/kg	3000	U
N	SW8270	4-Nitrophenol	ug/kg	3000	U
N	SW8270	Acenaphthene	ug/kg	600	U
N	SW8270	Acenaphthylene	ug/kg	600	U
N	SW8270	Acetophenone	ug/kg	600	U
N	SW8270	Aniline	ug/kg	600	UJ
N	SW8270	Anthracene	ug/kg	600	U
N	SW8270	Atrazine	ug/kg	600	U
N	SW8270	Azobenzene	ug/kg	600	U
N	SW8270	Benzaldehyde	ug/kg	600	U
N	SW8270	Benzo(a)anthracene	ug/kg	630	J
N	SW8270	Benzo(a)pyrene	ug/kg	670	
N	SW8270	Benzo(b)fluoranthene	ug/kg	1000	J
N	SW8270	Benzo(ghi)perylene	ug/kg	540	J
N	SW8270	Benzo(k)fluoranthene	ug/kg	450	J
N	SW8270	Benzoic Acid	ug/kg	3000	U
N	SW8270	Benzyl alcohol	ug/kg	1200	U
N	SW8270	Biphenyl	ug/kg	600	U
N	SW8270	Bis(2-Chloroethoxy)methane	ug/kg	600	U
N	SW8270	Bis(2-Chloroethyl)ether	ug/kg	600	U
N	SW8270	Bis(2-Chloroisopropyl)ether	ug/kg	600	U
N	SW8270	Bis(2-Ethylhexyl)phthalate	ug/kg	1500	
N	SW8270	Butylbenzylphthalate	ug/kg	600	U
N	SW8270	Caprolactam	ug/kg	600	U
N	SW8270	Carbazole	ug/kg	600	U
N	SW8270	Chrysene	ug/kg	1000	
N	SW8270	Di-n-butylphthalate	ug/kg	1200	U

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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SD-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41203-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8270	Di-n-octylphthalate	ug/kg	600	U
N	SW8270	Dibenz(a,h)anthracene	ug/kg	600	U
N	SW8270	Dibenzofuran	ug/kg	600	U
N	SW8270	Diethylphthalate	ug/kg	600	U
N	SW8270	Dimethylphthalate	ug/kg	600	U
N	SW8270	Diphenyl ether	ug/kg	600	U
N	SW8270	Diphenylamine	ug/kg	600	U
N	SW8270	Diphenylmethanone	ug/kg	600	U
N	SW8270	Fluoranthene	ug/kg	1800	J
N	SW8270	Fluorene	ug/kg	600	U
N	SW8270	Hexachlorobenzene	ug/kg	600	U
N	SW8270	Hexachlorobutadiene	ug/kg	600	U
N	SW8270	Hexachlorocyclopentadiene	ug/kg	1200	U
N	SW8270	Hexachloroethane	ug/kg	600	U
N	SW8270	Indeno(1,2,3-cd)pyrene	ug/kg	480	J
N	SW8270	Isophorone	ug/kg	600	U
N	SW8270	N-Nitrosodi-n-propylamine	ug/kg	600	U
N	SW8270	N-Nitrosodimethylamine	ug/kg	120	U
N	SW8270	N-Nitrosodiphenylamine	ug/kg	600	U
N	SW8270	Naphthalene	ug/kg	600	U
N	SW8270	Nitrobenzene	ug/kg	600	U
N	SW8270	Pentachlorophenol	ug/kg	600	U
N	SW8270	Phenanthrene	ug/kg	640	
N	SW8270	Phenol	ug/kg	600	U
N	SW8270	Pyrene	ug/kg	1100	
T	SW6010	Aluminum	mg/kg	5900	
T	SW6010	Antimony	mg/kg	4	
T	SW6010	Arsenic	mg/kg	57	
T	SW6010	Barium	mg/kg	140	
T	SW6010	Beryllium	mg/kg	0.2	J
T	SW6010	Cadmium	mg/kg	0.84	
T	SW6010	Calcium	mg/kg	1500	
T	SW6010	Chromium	mg/kg	39	
T	SW6010	Cobalt	mg/kg	7.2	
T	SW6010	Copper	mg/kg	270	
T	SW6010	Iron	mg/kg	41000	
T	SW6010	Lead	mg/kg	340	
T	SW6010	Magnesium	mg/kg	3300	
T	SW6010	Manganese	mg/kg	230	
T	SW6010	Nickel	mg/kg	19	
T	SW6010	Potassium	mg/kg	290	J
T	SW6010	Selenium	mg/kg	1.2	U
T	SW6010	Silver	mg/kg	2.6	
T	SW6010	Sodium	mg/kg	180	J
T	SW6010	Thallium	mg/kg	2.5	U
T	SW6010	Tin	mg/kg	12	U
T	SW6010	Vanadium	mg/kg	16	
T	SW6010	Zinc	mg/kg	450	
T	SW7471A	Mercury	mg/kg	0.04	J
N	E300	Bromide	mg/kg	24	U
N	E300	Chloride	mg/kg	55	
N	E300	Nitrate as N	mg/kg	6	U
N	E300	Nitrite as N	mg/kg	1.2	U
N	LACH_107_06_1_E	Nitrogen, as Ammonia	mg/kg	10	
N	E160.3	Percent Moisture	percent	18	
N	E160.3	Percent Solids	percent	82	
N	E300	Sulfate	mg/kg	48	U
N	Lloyd Kahn	Total Organic Carbon	mg/kg	8800	
N	SW8315	Acetaldehyde	ug/kg	240	UJ
N	SW8315	Formaldehyde	ug/kg	720	
N	LC65	Phthalic Acid/Phthalic anhydride	ug/kg	120	U

Table 2 - Sediment Results
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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SD-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41203-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
			Lab Sample Delivery Group	1317239	
N	SW8315A MOD	Hydrazine	ng/g	1.4	J
N	SW8315A MOD	Monomethylhydrazine (MMH)	ng/g	5.9	U
N	SW8315A MOD	UDMH	ng/g	5.9	U
			Lab Sample Delivery Group	WIL-26	
N	SW8033M	Dimethylformamide	mg/kg	0.21	U

Notes:
N = normal
FS = field sample
U = not detected, value is the detection limit
J = value is estimated
ug/kg = microgram per kilogram
mg/kg = milligram per kilogram
ng/g = nanogram per gram

Prepared by / Date: KJC 10/25/12
Checked by / Date: CSR 10/31/12

Table 2 - Surface Water Results
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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SW-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41200-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8260C	1,1,1,2-Tetrachloroethane	ug/l	1	U
N	SW8260C	1,1,1-Trichloroethane	ug/l	1	U
N	SW8260C	1,1,2,2-Tetrachloroethane	ug/l	0.5	U
N	SW8260C	1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/l	1	U
N	SW8260C	1,1,2-Trichloroethane	ug/l	1	U
N	SW8260C	1,1-Dichloroethane	ug/l	1	U
N	SW8260C	1,1-Dichloroethene	ug/l	1	U
N	SW8260C	1,1-Dichloropropene	ug/l	1	U
N	SW8260C	1,2,3-Trichlorobenzene	ug/l	1	U
N	SW8260C	1,2,3-Trichloropropane	ug/l	1	UJ
N	SW8260C	1,2,4-Trichlorobenzene	ug/l	1	U
N	SW8260C	1,2,4-Trimethylbenzene	ug/l	1	U
N	SW8260C	1,2-Dibromo-3-chloropropane	ug/l	5	U
N	SW8260C	1,2-Dibromoethane	ug/l	1	U
N	SW8260C	1,2-Dichlorobenzene	ug/l	1	U
N	SW8260C	1,2-Dichloroethane	ug/l	1	U
N	SW8260C	1,2-Dichloropropane	ug/l	1	U
N	SW8260C	1,3,5-Trimethylbenzene	ug/l	1	U
N	SW8260C	1,3-Dichlorobenzene	ug/l	1	U
N	SW8260C	1,3-Dichloropropane	ug/l	1	U
N	SW8260C	1,4-Dichlorobenzene	ug/l	1	U
N	SW8260C	1,4-Dioxane	ug/l	50	U
N	SW8260C	2,2-Dichloropropane	ug/l	1	U
N	SW8260C	2,4,4-Trimethyl-1-pentene	ug/l	1	U
N	SW8260C	2,4,4-Trimethyl-2-pentene	ug/l	1	U
N	SW8260C	2-Butanone	ug/l	10	U
N	SW8260C	2-Chlorotoluene	ug/l	1	U
N	SW8260C	2-Hexanone	ug/l	10	U
N	SW8260C	4-Chlorotoluene	ug/l	1	U
N	SW8260C	4-iso-Propyltoluene	ug/l	1	U
N	SW8260C	4-Methyl-2-pentanone	ug/l	10	U
N	SW8260C	Acetic acid, methyl ester	ug/l	20	U
N	SW8260C	Acetone	ug/l	50	U
N	SW8260C	Benzene	ug/l	1	U
N	SW8260C	Bromobenzene	ug/l	1	U
N	SW8260C	Bromochloromethane	ug/l	1	U
N	SW8260C	Bromodichloromethane	ug/l	0.5	U
N	SW8260C	Bromoform	ug/l	1	U
N	SW8260C	Bromomethane	ug/l	2	U
N	SW8260C	Butane, 2-methoxy-2-methyl-	ug/l	5	U
N	SW8260C	Carbon disulfide	ug/l	10	U
N	SW8260C	Carbon tetrachloride	ug/l	1	U
N	SW8260C	Chlorobenzene	ug/l	1	U
N	SW8260C	Chlorodibromomethane	ug/l	0.5	U
N	SW8260C	Chloroethane	ug/l	2	U
N	SW8260C	Chloroform	ug/l	1	U
N	SW8260C	Chloromethane	ug/l	2	U
N	SW8260C	Cis-1,2-Dichloroethene	ug/l	1.1	
N	SW8260C	cis-1,3-Dichloropropene	ug/l	0.4	U
N	SW8260C	Cyclohexane	ug/l	1	U

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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SW-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41200-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8260C	Dibromomethane	ug/l	1	U
N	SW8260C	Dichlorodifluoromethane	ug/l	1	U
N	SW8260C	Diethyl ether	ug/l	1	U
N	SW8260C	Ethyl benzene	ug/l	1	U
N	SW8260C	Ethyl-t-Butyl Ether	ug/l	5	U
N	SW8260C	Hexachlorobutadiene	ug/l	0.4	U
N	SW8260C	Isopropyl ether	ug/l	10	U
N	SW8260C	Isopropylbenzene	ug/l	1	U
N	SW8260C	Methyl cyclohexane	ug/l	1	U
N	SW8260C	Methyl Tertbutyl Ether	ug/l	1	U
N	SW8260C	Methylene chloride	ug/l	2	U
N	SW8260C	n-Butylbenzene	ug/l	1	U
N	SW8260C	Naphthalene	ug/l	5	U
N	SW8260C	Propylbenzene	ug/l	1	U
N	SW8260C	sec-Butylbenzene	ug/l	1	U
N	SW8260C	Styrene	ug/l	1	U
N	SW8260C	tert-Butylbenzene	ug/l	1	U
N	SW8260C	Tetrachloroethene	ug/l	1	U
N	SW8260C	Tetrahydrofuran	ug/l	10	U
N	SW8260C	Toluene	ug/l	1	U
N	SW8260C	trans-1,2-Dichloroethene	ug/l	1	U
N	SW8260C	trans-1,3-Dichloropropene	ug/l	0.4	U
N	SW8260C	Trichloroethene	ug/l	1	U
N	SW8260C	Trichlorofluoromethane	ug/l	1	U
N	SW8260C	Vinyl chloride	ug/l	0.5	U
N	SW8260C	Xylene, o	ug/l	1	U
N	SW8260C	Xylenes (m&p)	ug/l	2	U
N	SW8270	1,2,4,5-Tetrachlorobenzene	ug/l	4.7	U
N	SW8270	1-Methylnaphthalene	ug/l	4.7	U
N	SW8270	2,3,4,6-Tetrachlorophenol	ug/l	4.7	U
N	SW8270	2,4,5-Trichlorophenol	ug/l	4.7	U
N	SW8270	2,4,6-Trichlorophenol	ug/l	4.7	U
N	SW8270	2,4-Dichlorophenol	ug/l	4.7	U
N	SW8270	2,4-Dimethylphenol	ug/l	4.7	U
N	SW8270	2,4-Dinitrophenol	ug/l	4.7	U
N	SW8270	2,4-Dinitrotoluene	ug/l	4.7	U
N	SW8270	2,6-Dinitrotoluene	ug/l	4.7	U
N	SW8270	2-Chloronaphthalene	ug/l	4.7	U
N	SW8270	2-Chlorophenol	ug/l	4.7	U
N	SW8270	2-Methylnaphthalene	ug/l	0.94	U
N	SW8270	2-Methylphenol	ug/l	4.7	U
N	SW8270	2-Nitroaniline	ug/l	4.7	U
N	SW8270	2-Nitrophenol	ug/l	4.7	U
N	SW8270	3 & 4 Methylphenol	ug/l	4.7	U
N	SW8270	3,3`-Dichlorobenzidine	ug/l	4.7	U
N	SW8270	3-Nitroaniline	ug/l	4.7	U
N	SW8270	4,6-Dinitro-2-methylphenol	ug/l	4.7	U
N	SW8270	4-Bromophenyl phenyl ether	ug/l	4.7	U
N	SW8270	4-Chloro-3-methylphenol	ug/l	4.7	U
N	SW8270	4-Chloroaniline	ug/l	4.7	U

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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SW-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41200-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
N	SW8270	4-Chlorophenyl phenyl ether	ug/l	4.7	U
N	SW8270	4-Nitroaniline	ug/l	4.7	U
N	SW8270	4-Nitrophenol	ug/l	4.7	U
N	SW8270	Acenaphthene	ug/l	0.94	U
N	SW8270	Acenaphthylene	ug/l	0.28	U
N	SW8270	Acetophenone	ug/l	4.7	U
N	SW8270	Aniline	ug/l	4.7	UJ
N	SW8270	Anthracene	ug/l	0.94	U
N	SW8270	Atrazine	ug/l	4.7	U
N	SW8270	Azobenzene	ug/l	4.7	U
N	SW8270	Benzaldehyde	ug/l	4.7	U
N	SW8270	Benzo(a)anthracene	ug/l	0.28	U
N	SW8270	Benzo(a)pyrene	ug/l	0.19	U
N	SW8270	Benzo(b)fluoranthene	ug/l	0.28	U
N	SW8270	Benzo(ghi)perylene	ug/l	0.47	U
N	SW8270	Benzo(k)fluoranthene	ug/l	0.28	U
N	SW8270	Benzoic Acid	ug/l	4.7	U
N	SW8270	Benzyl alcohol	ug/l	9.4	U
N	SW8270	Biphenyl	ug/l	4.7	U
N	SW8270	Bis(2-Chloroethoxy)methane	ug/l	4.7	U
N	SW8270	Bis(2-Chloroethyl)ether	ug/l	4.7	U
N	SW8270	Bis(2-Chloroisopropyl)ether	ug/l	4.7	U
N	SW8270	Bis(2-Ethylhexyl)phthalate	ug/l	1.9	U
N	SW8270	Butylbenzylphthalate	ug/l	4.7	U
N	SW8270	Caprolactam	ug/l	4.7	UJ
N	SW8270	Carbazole	ug/l	4.7	U
N	SW8270	Chrysene	ug/l	0.94	U
N	SW8270	Di-n-butylphthalate	ug/l	4.7	U
N	SW8270	Di-n-octylphthalate	ug/l	4.7	U
N	SW8270	Dibenz(a,h)anthracene	ug/l	0.47	U
N	SW8270	Dibenzofuran	ug/l	4.7	U
N	SW8270	Diethylphthalate	ug/l	4.7	U
N	SW8270	Dimethylphthalate	ug/l	4.7	U
N	SW8270	Diphenyl ether	ug/l	4.7	U
N	SW8270	Diphenylmethanone	ug/l	4.7	U
N	SW8270	Fluoranthene	ug/l	0.94	U
N	SW8270	Fluorene	ug/l	0.94	U
N	SW8270	Hexachlorobenzene	ug/l	0.94	U
N	SW8270	Hexachlorocyclopentadiene	ug/l	4.7	U
N	SW8270	Hexachloroethane	ug/l	2.8	U
N	SW8270	Indeno(1,2,3-cd)pyrene	ug/l	0.47	U
N	SW8270	Isophorone	ug/l	4.7	U
N	SW8270	N-Nitrosodiphenylamine	ug/l	4.7	U
N	SW8270	Nitrobenzene	ug/l	4.7	U
N	SW8270	Pentachlorophenol	ug/l	0.94	U
N	SW8270	Phenanthrene	ug/l	0.19	U
N	SW8270	Phenol	ug/l	4.7	U
N	SW8270	Pyrene	ug/l	4.7	U
N	WS-MS-0012	N-Nitrosodi-n-propylamine	ng/l	2	U
N	WS-MS-0012	N-Nitrosodimethylamine	ng/l	8.6	

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			Loc Name	EDSD/SW7	
			Field Sample ID	OC-SW-EDSD/SW7-XXX	
			Field Sample Date	06/18/12	
			QC Code	FS	
			Lab Sample Delivery Group	360-41200-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual
T	SW6010	Aluminum	ug/l	120	
T	SW6010	Antimony	ug/l	6	U
T	SW6010	Arsenic	ug/l	7.8	J
T	SW6010	Barium	ug/l	40	
T	SW6010	Beryllium	ug/l	1	U
T	SW6010	Cadmium	ug/l	1	U
T	SW6010	Calcium	ug/l	38000	
T	SW6010	Chromium	ug/l	8.7	
T	SW6010	Cobalt	ug/l	2.2	J
T	SW6020	Copper	ug/l	1.9	
T	SW6010	Iron	ug/l	1700	
T	SW6020	Lead	ug/l	1.5	
T	SW6010	Magnesium	ug/l	6100	
T	SW6010	Manganese	ug/l	910	
T	SW6010	Nickel	ug/l	3.7	J
T	SW6010	Potassium	ug/l	5400	
T	SW6010	Selenium	ug/l	10	U
T	SW6020	Silver	ug/l	0.14	
T	SW6010	Sodium	ug/l	82000	
T	SW6010	Thallium	ug/l	10	U
T	SW6010	Tin	ug/l	50	U
T	SW6010	Vanadium	ug/l	10	U
T	SW6010	Zinc	ug/l	21	J
T	SW7470A	Mercury	ug/l	0.2	U
N	E300	Bromide	mg/l	0.11	
N	E300	Chloride	mg/l	140	
N	A2340B	Hardness	mg/l	120	
N	E300	Nitrate as N	mg/l	1.1	
N	E300	Nitrite as N	mg/l	0.1	U
N	LACH_107_0	Nitrogen, as Ammonia	mg/l	10	
N	E300	Sulfate	mg/l	70	
N	A5310_TOC_	Total Organic Carbon	mg/l	4.3	
N	A2540D	Total Suspended Solids	mg/l	12	
			Lab Sample Delivery Group	1316839	
N	SW8000B	Kempore (Azodicarbonamide)	ug/l	1000	U
N	SW8000B	OPEX	ug/l	100	UJ

Notes:

N = normal

FS = field sample

U = not detected, value is the detection limit

J = value is estimated

ug/l = microgram per liter

ng/l = nanogram per liter

mg/l = milligram per liter

Prepared by / Date: KJC 10/25/12

Checked by / Date: CSR 10/31/12

Table 3
Data Validation Action Summary
Data Validation Report
Operable Unit 2 June 2012 Surface Water and Sediment Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

Sample Delivery Group	Lab Sample ID	Analysis Method	Field Sample ID	Parameter Name	Lab Result	Lab Qualifier	Validated Result	Validation Qualifier	Validation Reason Code	Result Units
360-41200-1	360-41200-1	SW8260C	OC-SW-EDSD/SW7-XXX	1,2,3-Trichloropropane	1	U *	1	UJ	LCS-RPD	ug/l
360-41203-1	360-41203-1	SW8260C	OC-SD-EDSD/SW7-XXX	Acetone	250	U *	250	UJ	LCS-L	ug/kg
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW7-XXX	Aniline	4.7	U *	4.7	UJ	LCS-L	ug/l
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW7-XXX	Caprolactam	4.7	U *	4.7	UJ	LCS-L	ug/l
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW7-XXX	Di-n-butylphthalate	1.1	J B	4.7	U	BL1	ug/l
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	Aniline	600	U *	600	UJ	LCS-L	ug/kg
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	Benzo(a)anthracene	630	*	630	J	LCS-H	ug/kg
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	Benzo(b)fluoranthene	1000	*	1000	J	LCS-H	ug/kg
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	Fluoranthene	1800	*	1800	J	LCS-H	ug/kg
360-41203-1	360-41203-1	SW6010	OC-SD-EDSD/SW7-XXX	Tin	5.5	J B	12	U	BL1	mg/kg
360-41203-1	360-41203-1	SW8315	OC-SD-EDSD/SW7-XXX	Acetaldehyde	240	U	240	UJ	MS-L	ug/kg
1316839	6693008	SW8000B	OC-SW-EDSD/SW7-XXX	OPEX	100	U	100	UJ	HT	ug/l

Units:
ug/l = microgram per liter
ug/kg = microgram per kilogram
mg/kg = milligram per kilogram

Validation Qualifier:
U = not detected, value is the detection limit
J = value is estimated

Validation Reason Codes:
BL1 = Method Blank Qualifier
HT = Holding time for prep or analysis exceeded
LCS-H = LCS recovery high
LCS-L = LCS recovery low
LCS-RPD = LCS-LCSD RPD limit exceeded
MS-L = MS and/or MSD recovery low

Prepared by / Date: KJC 10/25/12
Checked by / Date: CSR 10/31/12

Table 4 - Sediment Results
Tentatively Identified Compounds - SVOCs
Data Validation Report
Operable Unit 2 June 2012 Surface Water and Sediment Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Method	Field Sample ID	Sample Date	CAS #	Analyte	RT	Final Result	Q	Final Qualifier	Units	DF	Analysis Date	Analysis Time
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC01	Unknown	13.36	470	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC02	Unknown	13.39	520	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC03	Unknown	13.43	450	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC04	Unknown	13.45	320	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC05	Unknown	13.51	370	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC06	Unknown	13.54	610	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC07	Unknown	13.57	610	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM
360-41203-1	360-41203-1	SW8270	OC-SD-EDSD/SW7-XXX	6/18/2012	TIC08	Unknown	13.62	290	TJ	NJ	ug/kg	20	7/2/2012	10:05:00 PM

ug/kg = microgram per kilogram
J = value is estimated
N = presumptively present
T = Tentatively identified compound, the result is estimated

Prepared by / Date: KJC 07/16/12
Checked by / Date: MJW 10/01/12

Table 4 - Surface Water Results
Tentatively Identified Compounds - SVOCs
Data Validation Report
Operable Unit 2 June 2012 Surface Water and Sediment Sampling Event
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Method	Field Sample ID	Sample Date	CAS #	Analyte	RT	Final Result	Q	Final Qualifier	Units	DF	Analysis Date	Analysis Time
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC01	Unknown	1.74	58	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC02	Unknown	10.05	0.43	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	100-23-2	Benzenamine, N,N-dimethyl-4-nitro-	12.44	1.2	TJN	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC03	Unknown	14.64	0.63	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC04	Unknown	14.67	1.5	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC05	Unknown	14.77	1.8	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	TIC06	Unknown	15.38	1.6	TJ	NJ	ug/l	1	6/20/2012	8:15:00 PM
360-41200-1	360-41200-1	SW8270	OC-SW-EDSD/SW-7-XXX	6/18/2012	111-76-2	Ethanol, 2-butoxy-	5.81	0.67	TJN	NJ	ug/l	1	6/20/2012	8:15:00 PM

ug/l = microgram per liter
J = value is estimated
N = presumptively present
T = Tentatively identified compound, the result is estimated

Prepared by / Date: KJC 08/08/12
Checked by / Date: MJW 10/01/12

CHECKLISTS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

FILE COPY

ANALYTICAL REPORT

Job Number: 360-41200-1

SDG Number: 360-41200-1

Job Description: Olin Chemical Superfund Site SW

For:
Olin Corporation
PO BOX 248
Charleston, TN 37310-0248

Attention: Mr. James Cashwell

Approved for release.
James T Wickham
Technology Manager
7/27/2012 2:47 PM

Designee for
Becky C Mason
Project Manager II
becky.mason@testamericainc.com
07/27/2012

Results relate only to the items tested and the sample(s) as received by the laboratory. The test results in this report meet all NELAC requirements for accredited parameters, exceptions are noted in this report. Pursuant to NELAC, this report may not be reproduced except in full, and with written approval from the laboratory. TestAmerica Westfield Certifications and Approvals: MADEP MA014, RIDOH57, CTDPH 0494, VT DECWSD, NELAP NH DES 2539, NELAP NY 10843, NY ELAP 10843, North Carolina 647. Field sampling is performed under SOPs WE-FLD-001 and WE-FLD-002.

CHECKED FOR COMPLETENESS
OF PARAMETERS ORDERED BY:

TestAmerica Laboratories, Inc.
TestAmerica Westfield Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085
Tel (413) 572-4000 Fax (413) 572-3707 www.testamericainc.com

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

FILE COPY

ANALYTICAL REPORT

Job Number: 360-41203-1

SDG Number: 360-41203-1

Job Description: Olin Chemical Superfund Site

For:
Olin Corporation
PO BOX 248
Charleston, TN 37310-0248

Attention: Mr. James Cashwell

Approved for release.
Chris F Reynolds
QA Manager
7/11/2012 8:50 AM

Designee for
Becky C Mason
Project Manager II
becky.mason@testamericainc.com
07/11/2012

Results relate only to the items tested and the sample(s) as received by the laboratory. The test results in this report meet all NELAC requirements for accredited parameters, exceptions are noted in this report. Pursuant to NELAC, this report may not be reproduced except in full, and with written approval from the laboratory. TestAmerica Westfield Certifications and Approvals: MADEP MA014, RIDOH57, CTDPH 0494, VT DECWSD, NELAP NH DES 2539, NELAP NY 10843, NY ELAP 10843, North Carolina 647. Field sampling is performed under SOPs WE-FLD-001 and WE-FLD-002.

CHECKED FOR COMPLETENESS OF PARAMETERS ORDERED BY:

TestAmerica Laboratories, Inc.
TestAmerica Westfield Westfield Executive Park, 53 Southampton Road, Westfield, MA 01085
Tel (413) 572-4000 Fax (413) 572-3707 www.testamericainc.com

ACCREDITED IN ACCORDANCE WITH nelac

FILE COPY

OLIN CORPORATION
RI ANALYTICAL - WILMINGTON
SDG: WIL-26
SF3645

CHECKED FOR COMPLETENESS
OF PARAMETERS ORDERED BY:

KATAHDIN ANALYTICAL SERVICES, INC.
600 TECHNOLOGY WAY
SCARBOROUGH, ME 04074

eurofins | Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Type I Data Package

Prepared for:

Olin Corporation
Suite 200
3855 North Ocoee Street
Cleveland TN 37312

Project: Olin Wilmington, MA / 6107120016
Sediment Sample
Collected on 06/18/12

SDG# OLN78

GROUP	SAMPLE NUMBERS
1317239	6695248

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-08A-TX

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date: 07/05/2012**

Dana M. Kauffman
Manager

CHECKED FOR COMPLETENESS
OF PARAMETERS ORDERED BY:

Any questions or concerns you might have regarding this data package should be directed to your client representative, Nicole Maljovec at Ext. 1537.

Total Number of Pages __55_____

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
VOLATILE ORGANICS BY METHOD SW8260B/624
SED

Reviewer/Date Mike Washburn 9/4/12
Sr.Review/Date Chris Ricardi 10/31/12
Lab Report # 360-41203-1
Project# 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

[✓] *Name of Laboratory* [✓] *Address* [✓] *Project ID* [✓] *Phone #* [✓] *Sample identification – Field and Laboratory*
Client Information: [✓] *Name* [✓] *Address* [✓] *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

[✓] *Narrative serves as an exception report for the project and method QA/QC performance.* [✓] *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include completed Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☐ Container type noted ☐ Condition observed ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Water - 40 mL VOA vial/HCL to pH<2, cool to 4°C
Soil - 5 gram Encore™/cool to 4°C or 40 mL VOA vial with field preservation of sodium bisulfate (low-level) or methanol (high-level) or field preservation in water if soils are reactive to sodium bisulfate (i.e. alkaline conditions, excessive humic acid content, etc.)

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable); qualify both positive data and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

ACTION: If each VOA vial for a sample contains air bubbles or the VOA vial analyzed contained air bubbles, flag positives (J) and reject nondetects (R).

1.5.2 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ Date and time collected ☑ Analyst Initials ☑ Dilution Factor ☐ % moisture or solids ☑ Reporting limits
☑ *Clean-up method* ☑ Analysis method ☐ Preparation method ☑ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☑ Matrix ☐ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☑ Surrogate recoveries

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Yes [ ] **No [✓]** N/A [ ] Comments:

For water samples, the holding time is 7 days (aromatics) from sampling for unpreserved samples and 14 days for preserved samples.

For soil samples, the holding time is 14 days from sampling if field preserved with sodium bisulfate/methanol/or water. If an Encore™ sampler was used, the lab must ***preserve*** the sample within 48 hours. Analytical holding time from time of preservation is 14 days.

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. For soil samples professional judgement will be used to determine if rejection is necessary.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes [✓]** No [ ] N/A [ ] Comments:

Purge and Trap Water: 5030B Soil: 5035✓
Volatile Organics 8260B✓C

MS 8/14/12 use2 most current method

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the **Yes [✓]** No [ ] N/A [ ] Comments:
☐ SOW ☑ QAPP ☐ Lab ☐ MADEP

Evaluate PQLs with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation. Provide a listing of all samples with PQLs that are elevated due to dilution, sample matrix, or preparation factors.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *The MADEP QA/QC Guidelines requires a minimum compound reporting list for volatile organic compounds. Determine target compound requirement and verify reporting list.*

3.4 Were Tentatively Identified Compounds (TICs) reported? **Yes** [✓] No [ ] N/A [ ] Comments:

***NOTE**: TICs are only required for samples with full MADEP target list. Determine if TICs are required. MADEP requires that all TICs be reported to the LCS. Per the MADEP guidance, TICs, which are identified as aliphatic hydrocarbons, do not have to be reported as TICs. However, these compounds must be evaluated as part of the health-based risk assessment approach (VPH/EPH).*

None identified

***ACTION**: Qualify reported TIC results as estimated and flag (NJ).*

3.5 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP guidance states that if a diluted and an undiluted analysis is performed, the laboratory should report results for the lowest dilution within the valid calibration range for each analyte.*

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Are the Method Blank Summaries present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See attached table for PQLs). **Yes [✓]** No [ ] N/A [ ] Comments:

NOTE: *MADEP allows common laboratory contaminants (acetone, methylene chloride and 2-butanone) to be present at concentrations < 5x the PQL.*

4.4 Do any method blanks have positive results for VOC parameters? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

For the common contaminants (methylene chloride, acetone, toluene, and 2-butanone):

If the sample concentration is < 10 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 10 × blank value, no qualification is needed.

For other VOC contaminants:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 10x or 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.2 Is the recovery of any analyte outside of control limits? Yes [✓] **No** [ ] N/A [ ] Comments:

Acetone 36/37

NOTE: *A full target, second source LCS is required by MADEP.*

NOTE: Use *MADEP guidelines list LCS recovery limits of 70-130. Recovery limits are 40-160% for acetone, MEK, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane and 1,4-Dioxane.*

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but > 10%, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R). Document qualified compounds and percent recoveries in the validation report.

5.4 Are 80% of LCS recoveries within laboratory control limits? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If 80% of LCS recoveries are not within limits, use professional judgment and consult Senior Chemist.

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified. **Yes** [ ] No [✓] N/A [ ] Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data. **Yes** [ ] No [ ] N/A [✓] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes [ ] No [✓] N/A [ ] Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

6.4 Are any VOC spike recoveries outside of the QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: *A full target, second source MS/MSD is required by MADEP.*

NOTE: *MADEP guidelines list MS/MSD recovery limits as 70-130.*

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify both positive results and non-detects (J). If recovery is < 10%, reject non-detects (R).

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result
D = MSD result

NOTE: *MADEP guidelines list MS/MSD RPD limit for water is ≤ 20 and soils is ≤ 30.*

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Surrogate Recoveries

Were one or more VOC surrogate recoveries outside of laboratory limits for any sample or method blank? If yes, were samples re-analyzed?

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: %R = QD x 100% Where: S = MS sample result
D = MSD sample result

NOTE: No qualification is required if two of the surrogates are within acceptable QC limits. If surrogate recoveries fail due to dilution, results are not flagged. Document on checklist and in the case narrative.

NOTE: *MADEP guidelines list surrogate limits for both water and soils as 70-130%. Surrogate recovery limits greater than ± 30% are allowed for difficult matrices (wastes, sludges, etc.) with appropriate analytical documentation.*

ACTION: If recoveries are >10%, but fail to meet quality control criteria: (1) For recoveries below the QC limit but >10%, qualify nondetects and positives (J), and (2) For recoveries above the QC limit, qualify only positives (J). If any surrogate recovery is <10% (unless the QC limits are below 10%, in which case, results are flagged as stated above), flag positives (J) and reject nondetects (R).

8.0 Sampling Accuracy

8.1 Were trip blanks shipped with VOC samples and analyzed?

Yes [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP requires trip blanks per the following frequency:*

	Soil/Sediment	*Aqueous*	*Drinking Water*
Option 1	*Not Required*	*Not Required*	*1 per cooler VOAs/VPH*
Option 3	*1 per 10 samples*	*1 per 10 samples*	*1 per 10 samples*

8.2 Do any trip blanks have positive results?

Yes [ ] **No [ ]** N/A [✓] Comments:

ACTION: Prepare a list of samples shipped in the same cooler as a contaminated blank.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected. **Yes** [ ] No [ ] N/A [✓] Comments:

8.3 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

NOTE: *MADEP does not specify the collection of rinsate blanks.*

8.4 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-, ambient-, or shipment-derived. If results are not lab-, ambient-, or shipment-related, qualify according to the table above (8.2).

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [ ] No [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

☐ SOW ☐ QAPP *(1 per 10)* ☐ *MADEP Option 1(1 per 20)*

☐ *MADEP Option 3 (1 per 10)*

9.3 Was the RPD ≤ 50% for soils or 30% for waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: Qualify data (J) for both sample results if the RPD goal is exceeded.

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999.

STL-Westfield, 2002. "Olin – General Chemistry Control Limits (Soil & Water)," Severn Trent Laboratories, Inc., 53 Southampton Road, Westfield, MA, 01085.

U.S. Environmental Protection Agency (USEPA), 1996. "Region 1 EPA-NE Data Validation Guidelines For Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92619

Method: 8260C
Preparation: 5035

LCS Lab Sample ID:	LCS 360-92619/1-A	Analysis Batch:	360-92620	Instrument ID:	HP #1 GC/MS
Client Matrix:	Solid	Prep Batch:	360-92619	Lab File ID:	V56955-LCS.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5 g
Analysis Date:	07/02/2012 1625	Units:	ug/Kg	Final Weight/Volume:	5 g
Prep Date:	07/02/2012 1527				
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92619/2-A	Analysis Batch:	360-92620	Instrument ID:	HP #1 GC/MS
Client Matrix:	Solid	Prep Batch:	360-92619	Lab File ID:	V56956.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5 g
Analysis Date:	07/02/2012 1648	Units:	ug/Kg	Final Weight/Volume:	5 g
Prep Date:	07/02/2012 1527				
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
1,1,1,2-Tetrachloroethane	110	113	70 - 130	2	20		
1,1,1-Trichloroethane	90	93	70 - 130	3	20		
1,1,2,2-Tetrachloroethane	111	114	70 - 130	3	20		
1,1,2-Trichloroethane	82	86	70 - 130	5	20		
1,1-Dichloroethane	90	93	70 - 130	3	20		
1,1-Dichloroethene	93	91	70 - 130	2	20		
1,2,3-Trichloropropane	110	115	70 - 130	4	20		
1,2,3-Trichlorobenzene	117	117	70 - 130	0	20		
1,2,4-Trichlorobenzene	118	120	70 - 130	2	20		
1,2-Dichlorobenzene	111	117	70 - 130	5	20		
1,2-Dichloroethane	89	91	70 - 130	2	20		
1,3,5-Trimethylbenzene	109	114	70 - 130	4	20		
1,3-Dichlorobenzene	113	116	70 - 130	3	20		
1,4-Dichlorobenzene	112	117	70 - 130	4	20		
1,4-Dioxane	100	117	70 - 130	15	20		
2,2-Dichloropropane	82	88	70 - 130	7	20		
2-Chlorotoluene	107	111	70 - 130	4	20		
2-Hexanone	61	63	70 - 130	3	20	*	*
4-Chlorotoluene	108	111	70 - 130	2	20		
Acetone	36	37	70 - 130	2	20	*	*
Benzene	86	87	70 - 130	0	20		
Bromobenzene	108	109	70 - 130	1	20		
Bromoform	108	112	70 - 130	4	20		
Bromomethane	94	99	70 - 130	6	20		
Carbon disulfide	116	121	70 - 130	4	20		
Carbon tetrachloride	92	94	70 - 130	2	20		
Chlorobenzene	108	109	70 - 130	1	20		
Chlorobromomethane	89	90	70 - 130	1	20		
Chlorodibromomethane	83	84	70 - 130	1	20		
1,2-Dibromo-3-Chloropropane	109	110	70 - 130	1	20		
Chloroethane	83	86	70 - 130	4	20		
Chloroform	89	92	70 - 130	3	20		
Chloromethane	86	89	70 - 130	4	20		
cis-1,2-Dichloroethene	90	90	70 - 130	0	20		
cis-1,3-Dichloropropene	81	83	70 - 130	2	20		
Dibromomethane	89	91	70 - 130	2	20		

MJW 9/4/12

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
VOLATILE ORGANICS BY METHOD SW8260B/624
SW

Reviewer/Date Mike Washburn 8/30/12
Sr.Review/Date Chris Circelli 10/31/12
Lab Report # 360-41200-1
Project# 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative:

Yes [ ] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.*

☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include completed Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form present?*):

Yes [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Water - 40 mL VOA vial/HCL to pH<2, cool to 4°C
Soil - 5 gram Encore™/cool to 4°C or 40 mL VOA vial with field preservation of sodium bisulfate (low-level) or methanol (high-level) or field preservation in water if soils are reactive to sodium bisulfate (i.e. alkaline conditions, excessive humic acid content, etc.)

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable); qualify both positive data and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

ACTION: If each VOA vial for a sample contains air bubbles or the VOA vial analyzed contained air bubbles, flag positives (J) and reject nondetects (R).

1.5.2 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ Date and time collected ☑ Analyst Initials ☑ Dilution Factor ☑ N/A % moisture or solids ☑ Reporting limits
☑ NA *Clean-up method* ☑ Analysis method ☑ Preparation method ☑ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☐ LCS recoveries ☑ MS/MSD recoveries and RPDs ☐ Surrogate recoveries

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded?

Yes [ ] **No** [✓] N/A [ ] Comments:

For water samples, the holding time is 7 days (aromatics) from sampling for unpreserved samples and 14 days for preserved samples.

For soil samples, the holding time is 14 days from sampling if field preserved with sodium bisulfate/methanol/or water. If an Encore™ sampler was used, the lab must ***preserve*** the sample within 48 hours. Analytical holding time from time of preservation is 14 days.

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. For soil samples professional judgement will be used to determine if rejection is necessary.

3.0 Laboratory Method

3.1 Was the correct laboratory method used?

Purge and Trap Water: 5030B Soil: 5035
Volatile Organics 8260B

Yes [✓] No [ ] N/A [ ] Comments:

C*

update method (most current)

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the
☐ SOW ☑ QAPP ☐ Lab ☐ MADEP

Yes [✓] No [ ] N/A [ ] Comments:

Evaluate PQLs with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation. Provide a listing of all samples with PQLs that are elevated due to dilution, sample matrix, or preparation factors.

* MJW 9/4/12

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *The MADEP QA/QC Guidelines requires a minimum compound reporting list for volatile organic compounds. Determine target compound requirement and verify reporting list.*

3.4 Were Tentatively Identified Compounds (TICs) reported? **Yes** [✓] No [ ] N/A [ ] Comments:

none identified

***NOTE**: TICs are only required for samples with full MADEP target list. Determine if TICs are required. MADEP requires that all TICs be reported to the LCS. Per the MADEP guidance, TICs, which are identified as aliphatic hydrocarbons, do not have to be reported as TICs. However, these compounds must be evaluated as part of the health-based risk assessment approach (VPH/EPH).*

***ACTION**: Qualify reported TIC results as estimated and flag (NJ).*

3.5 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP guidance states that if a diluted and an undiluted analysis is performed, the laboratory should report results for the lowest dilution within the valid calibration range for each analyte.*

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Are the Method Blank Summaries present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See attached table for PQLs). **Yes [✓]** No [ ] N/A [ ] Comments:

NOTE: *MADEP allows common laboratory contaminants (acetone, methylene chloride and 2-butanone) to be present at concentrations < 5x the PQL.*

4.4 Do any method blanks have positive results for VOC parameters? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

For the common contaminants (methylene chloride, acetone, toluene, and 2-butanone):

If the sample concentration is < 10 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 10 × blank value, no qualification is needed.

For other VOC contaminants:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 10x or 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.2 Is the recovery of any analyte outside of control limits? Yes [✓] **No** [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*

RDD-22 1,2,3-trichloropropane

NOTE: Use *MADEP guidelines list LCS recovery limits of 70-130. Recovery limits are 40-160% for acetone, MEK, 4-methyl-2-pentanone, 2-hexanone, dichlorodifluoromethane, bromomethane, chloromethane and 1,4-Dioxane.*

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but > 10%, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R). Document qualified compounds and percent recoveries in the validation report.

5.4 Are 80% of LCS recoveries within laboratory control limits? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If 80% of LCS recoveries are not within limits, use professional judgment and consult Senior Chemist.

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified. **Yes** [ ] No [✓] N/A [ ] Comments:

6.2 Is the MS/MSD Recovery Form present?

ACTION: If no, contact lab for resubmission of missing data. **Yes** [ ] No [ ] N/A [✓] Comments:

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix? **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

6.4 Are any VOC spike recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

NOTE: *A full target, second source MS/MSD is required by MADEP.*

NOTE: *MADEP guidelines list MS/MSD recovery limits as 70-130.*

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify both positive results and non-detects (J). If recovery is < 10%, reject non-detects (R).

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result, D = MSD result

NOTE: *MADEP guidelines list MS/MSD RPD limit for water is ≤ 20 and soils is ≤ 30.*

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Surrogate Recoveries

Were one or more VOC surrogate recoveries outside of laboratory limits for any sample or method blank? If yes, were samples re-analyzed?

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: %R = QD x 100% Where: S = MS sample result
D = MSD sample result

NOTE: No qualification is required if two of the surrogates are within acceptable QC limits. If surrogate recoveries fail due to dilution, results are not flagged. Document on checklist and in the case narrative.

NOTE: *MADEP guidelines list surrogate limits for both water and soils as 70-130%. Surrogate recovery limits greater than ± 30% are allowed for difficult matrices (wastes, sludges, etc.) with appropriate analytical documentation.*

ACTION: If recoveries are >10%, but fail to meet quality control criteria: (1) For recoveries below the QC limit but >10%, qualify nondetects and positives (J), and (2) For recoveries above the QC limit, qualify only positives (J). If any surrogate recovery is <10% (unless the QC limits are below 10%, in which case, results are flagged as stated above), flag positives (J) and reject nondetects (R).

8.0 Sampling Accuracy

8.1 Were trip blanks shipped with VOC samples and analyzed?

Yes [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP requires trip blanks per the following frequency:*

	Soil/Sediment	*Aqueous*	*Drinking Water*
Option 1	*Not Required*	*Not Required*	*1 per cooler VOAs/VPH*
Option 3	*1 per 10 samples*	*1 per 10 samples*	*1 per 10 samples*

8.2 Do any trip blanks have positive results?

Yes [ ] **No [ ]** N/A [✓] Comments:

ACTION: Prepare a list of samples shipped in the same cooler as a contaminated blank.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected. **Yes** [ ] No [✓] N/A [ ] Comments:

8.3 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist.

NOTE: *MADEP does not specify the collection of rinsate blanks.*

8.4 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-, ambient-, or shipment-derived. If results are not lab-, ambient-, or shipment-related, qualify according to the table above (8.2).

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [ ] No [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

☐ SOW ☐ QAPP *(1 per 10)* ☐ *MADEP Option 1(1 per 20)*

☐ *MADEP Option 3 (1 per 10)*

9.3 Was the RPD ≤ 50% for soils or 30% for waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: Qualify data (J) for both sample results if the RPD goal is exceeded.

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999.

STL-Westfield, 2002. "Olin – General Chemistry Control Limits (Soil & Water)," Severn Trent Laboratories, Inc., 53 Southampton Road, Westfield, MA, 01085.

U.S. Environmental Protection Agency (USEPA), 1996. "Region 1 EPA-NE Data Validation Guidelines For Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996.

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MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92562

Method: 8260C
Preparation: 5030C

LCS Lab Sample ID:	LCS 360-92562/3	Analysis Batch:	360-92562	Instrument ID:	HP #3 GC/MS
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	V20092.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5 mL
Analysis Date:	06/29/2012 1358	Units:	ug/L	Final Weight/Volume:	5 mL
Prep Date:	06/29/2012 1358				
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92562/4	Analysis Batch:	360-92562	Instrument ID:	HP #3 GC/MS
Client Matrix:	Water	Prep Batch:	N/A	Lab File ID:	V20093.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	5 mL
Analysis Date:	06/29/2012 1424	Units:	ug/L	Final Weight/Volume:	5 mL
Prep Date:	06/29/2012 1424				
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
1,1,1,2-Tetrachloroethane	97	95	70 - 130	3	20		
1,1,1-Trichloroethane	88	80	70 - 130	10	20		
1,1,2,2-Tetrachloroethane	84	84	70 - 130	1	20		
1,1,2-Trichloroethane	95	91	70 - 130	4	20		
1,1-Dichloroethane	91	85	70 - 130	7	20		
1,1-Dichloroethene	92	85	70 - 130	9	20		
1,1-Dichloropropene	87	79	70 - 130	10	20		
1,2,3-Trichlorobenzene	87	90	70 - 130	3	20		
1,2,3-Trichloropropane	83	103	70 - 130	22	20		*
1,2,4-Trichlorobenzene	79	80	70 - 130	1	20		
1,2,4-Trimethylbenzene	85	78	70 - 130	8	20		
1,2-Dibromo-3-Chloropropane	78	85	70 - 130	8	20		
1,2-Dichlorobenzene	86	85	70 - 130	1	20		
1,2-Dichloroethane	88	84	70 - 130	4	20		
1,2-Dichloropropane	83	77	70 - 130	8	20		
1,3,5-Trimethylbenzene	85	79	70 - 130	8	20		
1,3-Dichlorobenzene	90	88	70 - 130	2	20		
1,3-Dichloropropane	88	86	70 - 130	3	20		
1,4-Dichlorobenzene	88	84	70 - 130	4	20		
1,4-Dioxane	85	89	70 - 130	5	20		
2,2-Dichloropropane	87	81	70 - 130	8	20		
2-Butanone (MEK)	63	64	70 - 130	1	20	*	*
2-Chlorotoluene	82	78	70 - 130	5	20		
2-Hexanone	99	99	70 - 130	0	20		
4-Chlorotoluene	82	81	70 - 130	1	20		
4-Isopropyltoluene	84	78	70 - 130	7	20		
4-Methyl-2-pentanone (MIBK)	82	81	70 - 130	1	20		
Acetone	93	92	70 - 130	0	20		
Benzene	90	84	70 - 130	6	20		
Bromobenzene	76	74	70 - 130	3	20		
Bromoform	74	74	70 - 130	0	20		
Bromomethane	99	90	70 - 130	10	20		
Carbon disulfide	117	105	70 - 130	11	20		
Carbon tetrachloride	100	90	70 - 130	11	20		
Chlorobenzene	87	86	70 - 130	1	20		
Chlorobromomethane	89	86	70 - 130	3	20		

MJW 9/4/12

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
SEMI-VOLATILE ORGAINICS BY METHOD 8270C/625
SW

Reviewer/Date Mike Washburn 9/5/12
Sr. Review/Date Chris Ricaurte 10/31/12
Lab Report # 360-41200
Project # 6107120018

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative:

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☐ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present of completed COC? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include a copy of the completed Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of missing completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water - 1 Liter amber bottle/cool to 4°C
Soil - 8 oz soil jar/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment.

1.5.2 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* NA ☑ % moisture or solids ☑ *Reporting limits*
NA ☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☒ MS/MSD recoveries and RPDs ☑ Surrogate recoveries

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded?

NOTE: For water samples, the holding time is 7 days from sampling to extraction and 40 days from extraction to analysis. For soil samples, the holding time is 14 days from sampling to extraction and 40 days from extraction to analysis.

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. For soil samples professional judgement will be used to determine if rejection is necessary.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

Water Extraction	3510C or *3520C*
Soil Extraction	*3540C* or 3550B
Semi-volatile Organics	8270C D most current

ACTION: If no, contact project manager to inform Client of change; request variance from Client; contact laboratory to provide justification for method change compared to the requested method.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *The QAPP and MADEP QA/QC Guidelines provides PQLs for semi-volatile organic compounds. Verify proper PQLs were used for each data set.*

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 Were Tentatively Identified Compounds (TICs) reported? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE *TICs are only required for samples with full MADEP target list. Determine if TICs are required. MADEP requires that all TICs be reported to the LCS. Per the MADEP guidance, TICs, which are identified as aliphatic hydrocarbons, do not have to be reported as TICs. However, these compounds must be evaluated as part of the health-based risk assessment approach (VPH/EPH).*

ACTION*: Qualify reported TIC results as estimated and flag (NJ).*

3.5 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 For the analysis of SVOCs, has a method blank been analyzed for each analysis batch of field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP allows common laboratory contaminants (such as phthalates) to be present at concentrations < 5x the PQL*

4.4 Do any method blanks have positive results for SVOC parameters? Qualify data according to the following:

Yes [✓] **No** [ ] N/A [ ] Comments:

Acetophenone – 0.67 5x = 3.35

Di-n-butyl phthalate – 1.16 10x = 11.6

For the common contaminants (phthalates):

If the sample concentration is < 10 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 10 × blank value, no qualification is needed.

For other SVOC contaminants:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: For any blank with positive results, list all contaminants for each method blank, including the concentration detected and the flagging level (flagging level = 5x or 10x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgment to determine the usability of sample results associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of control limits? Yes [✓] **No** [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*

NOTE: *MADEP guidelines list LCS recovery limits as 40-140 for base-neutral compounds and 30-130 for the acid compounds. The following compounds must exhibit percent recoveries between 15-140%: 4-chloroaniline, 4-nitrophenol, phenol, and 2,4-dinitrophenol. The laboratory must identify analytes that routinely exceed these limits.*

Aniline - 39
Caprolactam - 33/32

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but > 10%, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

5.4 Are 80% of LCS recoveries within laboratory control limits? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If 80% of LCS recoveries are not within limits, use professional judgment and consult Senior Chemist.

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project specified MS/MSDs collected? List project samples that were spiked. **Yes** [ ] No [✓] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD recovery form present? **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix? **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.4 Are any SVOC spike recoveries outside of the QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: *A full target, second source MS/MSD is required by MADEP.*

NOTE: *MADEP guidelines list MS/MSD recovery limits as 40-140 for base-neutral compounds and 30-130 for acid compounds.*

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify both positive results and non-detects (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

NOTE: *MADEP guidelines list MS/MSD RPD limits for water as ≤ 20 and soils as ≤ 30.*

NOTE: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Surrogate Recoveries

Were one or more SVOC surrogate recoveries outside of laboratory limits for any sample or method blank? If yes, were samples re-analyzed? Yes [✓] **No** [✓] N/A [ ] Comments:

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~~Phenol-d5 = 19~~ MJW 9/5/12

NOTE: %R = QD x 100% Where: S = MS sample result
D = MSD sample result

NOTE: *MADEP guidelines list surrogate limits for soils as 30-130% for all surrogates, and for water as 30-130% for base-neutrals and 15-110% for acid surrogates.*

NOTE: Qualify BNE results based upon BNE surrogates and AE results based upon AE surrogates.

ACTION: If recoveries are >10%, but 2 or more from any one fraction (acid or base-neutral) fail to meet QC criteria: (1) For recoveries below the QC limit, qualify non-detects and positives (J), and (2) For recoveries above the QC limit, qualify only positives (J). If any surrogate recovery is <10% (unless the lab QC limits are below

10%, in which case, results are flagged as stated above), flag positives (J) and reject non-detects (R).

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the project chemist. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: *MADEP does not specify the collection of rinsate blanks.*

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: For the common contaminants (phthalates), qualification is applied as indicated above using a 10x blank value in lieu of a 5x blank value.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of the samples and their associated field duplicates. Yes [ ] **No** [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

☐ SOW ☐ QAPP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)*

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and **Yes** [ ] No [ ] N/A [✓] Comments:

attach to this review.

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

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U.S. Environmental Protection Agency (USEPA), 1996. "Region 1 EPA-NE Data Validation Guidelines For Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92116

Method: 8270D
Preparation: 3510C

LCS Lab Sample ID:	LCS 360-92116/2-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17808.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1705	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92116/3-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17809.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1736	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
1,1'-Biphenyl	89	89	40 - 140	1	20		
1,2,4,5-Tetrachlorobenzene	79	79	40 - 140	1	20		
1-Methylnaphthalene	80	79	40 - 140	0	20		
2,2'-oxybis[1-chloropropane]	78	79	40 - 140	1	20		
2,3,4,6-Tetrachlorophenol	89	88	30 - 130	2	20		
2,4,5-Trichlorophenol	96	98	30 - 130	2	20		
2,4,6-Trichlorophenol	97	98	30 - 130	1	20		
2,4-Dichlorophenol	91	93	30 - 130	2	20		
2,4-Dimethylphenol	94	98	30 - 130	4	20		
2,4-Dinitrophenol	59	56	30 - 130	4	20	J	J
2,4-Dinitrotoluene	93	92	40 - 140	1	20		
2,6-Dinitrotoluene	99	99	40 - 140	0	20		
2-Chloronaphthalene	75	75	40 - 140	1	20		
2-Chlorophenol	73	78	30 - 130	5	20		
2-Methylnaphthalene	82	82	40 - 140	0	20		
2-Methylphenol	67	71	30 - 130	5	20		
2-Nitroaniline	100	101	40 - 140	0	20		
2-Nitrophenol	85	84	30 - 130	2	20		
3 & 4 Methylphenol	63	69	30 - 130	9	20		
3,3'-Dichlorobenzidine	92	97	40 - 140	5	20		
3-Nitroaniline	100	101	40 - 140	1	20		
4,6-Dinitro-2-methylphenol	58	56	30 - 130	3	20	J	J
4-Bromophenyl phenyl ether	84	83	40 - 140	1	20		
4-Chloro-3-methylphenol	92	94	30 - 130	2	20		
4-Chloroaniline	72	74	40 - 140	3	20		
4-Chlorophenyl phenyl ether	85	85	40 - 140	0	20		
4-Nitroaniline	116	110	40 - 140	5	20		
4-Nitrophenol	36	37	30 - 130	3	20	J	J
Acenaphthene	80	82	40 - 140	2	20		
Acenaphthylene	84	84	40 - 140	0	20		
Acetophenone	88	90	40 - 140	2	20		
Aniline	39	41	40 - 140	6	20	J *	J
Anthracene	93	93	40 - 140	0	20		
Atrazine	123	122	40 - 140	0	20		
Azobenzene	100	99	40 - 140	1	20		
Benzaldehyde	98	98	40 - 140	0	20		

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Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92116

Method: 8270D
Preparation: 3510C

LCS Lab Sample ID:	LCS 360-92116/2-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17808.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1705	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92116/3-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17809.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1736	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Benzo[a]anthracene	90	95	40 - 140	6	20		
Benzo[a]pyrene	87	91	40 - 140	5	20		
Benzo[b]fluoranthene	89	87	40 - 140	2	20		
Benzo[g,h,i]perylene	87	99	40 - 140	13	20		
Benzo[k]fluoranthene	99	106	40 - 140	7	20		
Benzoic acid	41	39	40 - 140	7	20	J	J *
Benzophenone	93	91	40 - 140	3	20		
Benzyl alcohol	66	69	40 - 140	4	20	J	J
Bis(2-chloroethoxy)methane	92	87	40 - 140	5	20		
Bis(2-chloroethyl)ether	76	78	40 - 140	3	20		
Bis(2-ethylhexyl) phthalate	90	92	40 - 140	2	20		
Butyl benzyl phthalate	83	87	40 - 140	4	20		
Caprolactam	33	32	40 - 140	3	20	J *	J *
Carbazole	106	103	40 - 140	3	20		
Chrysene	85	84	40 - 140	1	20		
Dibenz(a,h)anthracene	88	98	40 - 140	11	20		
Dibenzofuran	90	90	40 - 140	0	20		
Diethyl phthalate	94	94	40 - 140	1	20		
Dimethyl phthalate	89	88	40 - 140	0	20		
Di-n-butyl phthalate	104	102	40 - 140	1	20		
Di-n-octyl phthalate	96	94	40 - 140	2	20		
Fluoranthene	99	99	40 - 140	0	20		
Fluorene	86	86	40 - 140	0	20		
Hexachlorobenzene	91	91	40 - 140	0	20		
Hexachlorocyclopentadiene	56	50	40 - 140	12	20	J	J
Hexachloroethane	72	74	40 - 140	4	20		
Indeno[1,2,3-cd]pyrene	87	99	40 - 140	13	20		
Isophorone	82	81	40 - 140	1	20		
N-Nitrosodi-n-propylamine	80	83	40 - 140	4	20		
N-Nitrosodiphenylamine	85	84	40 - 140	1	20		
Nitrobenzene	90	88	40 - 140	2	20		
Pentachlorophenol	80	76	30 - 130	5	20		
Phenanthrene	88	88	40 - 140	0	20		
Phenol	30	33	30 - 130	9	20	J	J
Pyrene	79	84	40 - 140	6	20		
Phenyl ether	89	89	40 - 140	0	20		

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Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Method Blank - Batch: 360-92116

Method: 8270D
Preparation: 3510C

Lab Sample ID:	MB 360-92116/1-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17807.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1633	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
1,1'-Biphenyl	ND		0.50	5.0
1,2,4,5-Tetrachlorobenzene	ND		0.50	5.0
1-Methylnaphthalene	ND		0.050	5.0
2,2'-oxybis[1-chloropropane]	ND		0.50	5.0
2,3,4,6-Tetrachlorophenol	ND		0.50	5.0
2,4,5-Trichlorophenol	ND		0.50	5.0
2,4,6-Trichlorophenol	ND		0.50	5.0
2,4-Dichlorophenol	ND		0.50	5.0
2,4-Dimethylphenol	ND		0.50	5.0
2,4-Dinitrophenol	ND		0.50	5.0
2,4-Dinitrotoluene	ND		0.50	5.0
2,6-Dinitrotoluene	ND		0.50	5.0
2-Chloronaphthalene	ND		0.50	5.0
2-Chlorophenol	ND		0.50	5.0
2-Methylnaphthalene	ND		0.050	1.0
2-Methylphenol	ND		0.50	5.0
2-Nitroaniline	ND		0.50	5.0
2-Nitrophenol	ND		0.50	5.0
3 & 4 Methylphenol	ND		0.50	5.0
3,3'-Dichlorobenzidine	ND		0.50	5.0
3-Nitroaniline	ND		0.50	5.0
4,6-Dinitro-2-methylphenol	ND		0.50	5.0
4-Bromophenyl phenyl ether	ND		0.50	5.0
4-Chloro-3-methylphenol	ND		0.50	5.0
4-Chloroaniline	ND		0.50	5.0
4-Chlorophenyl phenyl ether	ND		0.50	5.0
4-Nitroaniline	ND		0.50	5.0
4-Nitrophenol	ND		0.50	5.0
Acenaphthene	ND		0.050	1.0
Acenaphthylene	ND		0.050	0.30
Acetophenone	0.670	J	0.50	5.0
Aniline	ND		0.50	5.0
Anthracene	ND		0.070	1.0
Atrazine	ND		0.50	5.0
Azobenzene	ND		0.50	5.0
Benzaldehyde	ND		0.50	5.0
Benzo[a]anthracene	ND		0.17	0.30
Benzo[a]pyrene	ND		0.10	0.20
Benzo[b]fluoranthene	ND		0.15	0.30
Benzo[g,h,i]perylene	ND		0.094	0.50
Benzo[k]fluoranthene	ND		0.17	0.30
Benzoic acid	ND		0.50	5.0
Benzophenone	ND		0.50	5.0
Benzyl alcohol	ND		0.50	10
Bis(2-chloroethoxy)methane	ND		0.50	5.0

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Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Method Blank - Batch: 360-92116

Method: 8270D
Preparation: 3510C

Lab Sample ID:	MB 360-92116/1-A	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Client Matrix:	Water	Prep Batch:	360-92116	Lab File ID:	B17807.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	1000 mL
Analysis Date:	06/20/2012 1633	Units:	ug/L	Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1905			Injection Volume:	2 uL
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Bis(2-chloroethyl)ether	ND		0.50	5.0
Bis(2-ethylhexyl) phthalate	ND		0.50	2.0
Butyl benzyl phthalate	ND		0.50	5.0
Caprolactam	ND		0.50	5.0
Carbazole	ND		0.50	5.0
Chrysene	ND		0.17	1.0
Dibenz(a,h)anthracene	ND		0.064	0.50
Dibenzofuran	ND		0.50	5.0
Diethyl phthalate	ND		0.50	5.0
Dimethyl phthalate	ND		0.50	5.0
Di-n-butyl phthalate	1.16	J	0.60	5.0
Di-n-octyl phthalate	ND		0.73	5.0
Fluoranthene	ND		0.20	1.0
Fluorene	ND		0.080	1.0
Hexachlorobenzene	ND		0.50	1.0
Hexachlorocyclopentadiene	ND		0.50	5.0
Hexachloroethane	ND		0.50	3.0
Indeno[1,2,3-cd]pyrene	ND		0.079	0.50
Isophorone	ND		0.50	5.0
N-Nitrosodi-n-propylamine	ND		0.50	5.0
N-Nitrosodiphenylamine	ND		0.50	5.0
Nitrobenzene	ND		0.50	5.0
Pentachlorophenol	ND		0.50	1.0
Phenanthrene	ND		0.085	0.20
Phenol	ND		0.50	5.0
Pyrene	ND		0.19	5.0
Phenyl ether	ND		0.50	5.0

Surrogate	% Rec	Acceptance Limits
2-Fluorophenol	41	15 - 110
Phenol-d5	24	15 - 110
Nitrobenzene-d5	89	30 - 130
2,4,6-Tribromophenol	94	15 - 110
Terphenyl-d14	101	30 - 130
2-Fluorobiphenyl	78	30 - 130

Method Blank TICs- Batch: 360-92116

Cas Number	Analyte	RT	Est. Result	Qual
	Tentatively Identified Compound		None	

MJW
4/5/12

Version 1.3, Oct 2011

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
SEMI-VOLATILE ORGAINICS BY METHOD 8270C/625
SED

Reviewer/Date Mike Washburn 9/4/12
Sr. Review/Date Chris Ricardi 10/31/12
Lab Report # 360-41203
Project # 6107120018

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative:

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.*

☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present of completed COC? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include a copy of the completed Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of missing completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water - 1 Liter amber bottle/cool to 4°C
Soil - 8 oz soil jar/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment.

1.5.2 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☐ *Reporting limits*
NA *Clean-up method* ☑ Analysis method ☐ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☐ MS/MSD recoveries and RPDs ☐ Surrogate recoveries

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded?

NOTE: For water samples, the holding time is 7 days from sampling to extraction and 40 days from extraction to analysis. For soil samples, the holding time is 14 days from sampling to extraction and 40 days from extraction to analysis.

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. For soil samples professional judgement will be used to determine if rejection is necessary.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

Water Extraction	3510C or *3520C*
Soil Extraction	*3540C* or 3550B 3546 ✓
Semi-volatile Organics	8270C

ACTION: If no, contact project manager to inform Client of change; request variance from Client; contact laboratory to provide justification for method change compared to the requested method.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☐ QAPP ☐ Lab? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *The QAPP and MADEP QA/QC Guidelines provides PQLs for semi-volatile organic compounds. Verify proper PQLs were used for each data set.*

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 Were Tentatively Identified Compounds (TICs) reported? Yes [✓] No [ ] N/A [ ] Comments:

NOTE *TICs are only required for samples with full MADEP target list. Determine if TICs are required. MADEP requires that all TICs be reported to the LCS. Per the MADEP guidance, TICs, which are identified as aliphatic hydrocarbons, do not have to be reported as TICs. However, these compounds must be evaluated as part of the health-based risk assessment approach (VPH/EPH).*

ACTION*: Qualify reported TIC results as estimated and flag (NJ).*

3.5 If *dilutions were required, were dilution factors reported?* Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 For the analysis of SVOCs, has a method blank been analyzed for each analysis batch of field samples of 20 or less? Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP allows common laboratory contaminants (such as phthalates) to be present at concentrations < 5x the PQL*

4.4 Do any method blanks have positive results for SVOC parameters? Qualify data according to the following:

Yes [✓] **No** [ ] N/A [ ] Comments:

For the common contaminants (phthalates):

If the sample concentration is < 10 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 10 × blank value, no qualification is needed.

Bis(2-ethylhexl) phthalate - 16.5

10x = 165

Di-n-butil phthalate - 185

10x = 1,850

For other SVOC contaminants:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

Various TICs

ACTION: For any blank with positive results, list all contaminants for each method blank, including the concentration detected and the flagging level (flagging level = 5x or 10x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgment to determine the usability of sample results associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of control limits? Yes [✓] **No** [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*

NOTE: *MADEP guidelines list LCS recovery limits as 40-140 for base-neutral compounds and 30-130 for the acid compounds. The following compounds must exhibit percent recoveries between 15-140%: 4-chloroaniline, 4-nitrophenol, phenol, and 2,4-dinitrophenol. The laboratory must identify analytes that routinely exceed these limits.*

2,4,5-trichlorophenol - 138
2,4,6-trichlorophenol - 141
3&4 methylphenol - 133
aniline - #38
benzo(a)anthracene - 142
benzo(b) fluoranthene - 152
Carbazole - 152

Di-n-butyl phthalate 141/159
Flouranthene - 153

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but > 10%, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

5.4 Are 80% of LCS recoveries within laboratory control limits? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If 80% of LCS recoveries are not within limits, use professional judgment and consult Senior Chemist.

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project specified MS/MSDs collected? List project samples that were spiked. **Yes** [ ] No [✓] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD recovery form present? **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix? **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.4 Are any SVOC spike recoveries outside of the QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

NOTE: *A <u>full</u> target, second source MS/MSD is required by MADEP.*

NOTE: *MADEP guidelines list MS/MSD recovery limits as 40-140 for base-neutral compounds and 30-130 for acid compounds.*

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify both positive results and non-detects (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

NOTE: *MADEP guidelines list MS/MSD RPD limits for water as ≤ 20 and soils as ≤ 30.*

NOTE: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Surrogate Recoveries

Were one or more SVOC surrogate recoveries outside of laboratory limits for any sample or method blank? If yes, were samples re-analyzed? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: %R = QD x 100% Where: S = MS sample result
D = MSD sample result

NOTE: *MADEP guidelines list surrogate limits for soils as 30-130% for all surrogates, and for water as 30-130% for base-neutrals and 15-110% for acid surrogates.*

NOTE: Qualify BNE results based upon BNE surrogates and AE results based upon AE surrogates.

ACTION: If recoveries are >10%, but 2 or more from any one fraction (acid or base-neutral) fail to meet QC criteria: (1) For recoveries below the QC limit, qualify non-detects and positives (J), and (2) For recoveries above the QC limit, qualify only positives (J). If any surrogate recovery is <10% (unless the lab QC limits are below

10%, in which case, results are flagged as stated above), flag positives (J) and reject non-detects (R).

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the project chemist. Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: *MADEP does not specify the collection of rinsate blanks.*

8.2 Do any rinsate blanks have positive results? Yes [ ] **No [ ]** N/A [✓] Comments:

NOTE: For the common contaminants (phthalates), qualification is applied as indicated above using a 10x blank value in lieu of a 5x blank value.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of the samples and their associated field duplicates. Yes [ ] **No [✓]** N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes [ ]** No [ ] N/A [✓] Comments:

☐ SOW ☐ QAPP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)*

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and **Yes [ ]** No [ ] N/A [✓] Comments:

attach to this review.

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999.

STL-Westfield, 2002. "Olin – General Chemistry Control Limits (Soil & Water)," Severn Trent Laboratories, Inc., 53 Southampton Road, Westfield, MA, 01085.

U.S. Environmental Protection Agency (USEPA), 1996. "Region 1 EPA-NE Data Validation Guidelines For Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92527

Method: 8270D
Preparation: 3546

LCS Lab Sample ID:	LCS 360-92527/2-A	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Client Matrix:	Solid	Prep Batch:	360-92527	Lab File ID:	B18000.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.00 g
Analysis Date:	07/02/2012 2100	Units:	ug/Kg	Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92527/3-A	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Client Matrix:	Solid	Prep Batch:	360-92527	Lab File ID:	B18001.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.00 g
Analysis Date:	07/02/2012 2133	Units:	ug/Kg	Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
1,1'-Biphenyl	111	98	40 - 140	12	20		
1,2,4,5-Tetrachlorobenzene	98	89	40 - 140	10	30		
1,2,4-Trichlorobenzene	88	77	40 - 140	13	30		
1,2-Dichlorobenzene	95	85	40 - 140	11	30		
1,3-Dichlorobenzene	91	80	40 - 140	13	30		
1,4-Dichlorobenzene	93	82	40 - 140	12	30		
1-Methylnaphthalene	95	85	40 - 140	11	30		
N-Nitrosodimethylamine	85	78	40 - 140	8	30		
2,2'-oxybis[1-chloropropane]	98	87	40 - 140	12	30		
2,3,4,6-Tetrachlorophenol	139	119	40 - 140	15	30		
2,4,5-Trichlorophenol	138	118	30 - 130	16	30	*	
2,4,6-Trichlorophenol	141	124	30 - 130	12	30	*	
2,4-Dichlorophenol	115	98	30 - 130	17	30		
2,4-Dimethylphenol	118	101	30 - 130	16	30		
2,4-Dinitrophenol	56	62	30 - 130	11	30		
2,4-Dinitrotoluene	134	120	40 - 140	11	30		
2,6-Dinitrotoluene	139	124	40 - 140	11	30		
2-Chloronaphthalene	107	91	40 - 140	16	30		
2-Chlorophenol	111	98	30 - 130	13	30		
2-Methylnaphthalene	95	85	40 - 140	11	30		
2-Methylphenol	111	98	30 - 130	12	30		
2-Nitroaniline	135	115	40 - 140	16	30		
2-Nitrophenol	105	94	30 - 130	11	30		
3 & 4 Methylphenol	133	117	30 - 130	13	30	*	
3,3'-Dichlorobenzidine	92	82	40 - 140	11	30		
3-Nitroaniline	117	102	40 - 140	14	30		
4,6-Dinitro-2-methylphenol	87	86	30 - 130	1	30		
4-Bromophenyl phenyl ether	129	103	40 - 140	22	30		
4-Chloro-3-methylphenol	119	107	30 - 130	10	30		
4-Chloroaniline	67	60	40 - 140	11	30		
4-Chlorophenyl phenyl ether	119	104	40 - 140	14	30		
4-Nitroaniline	132	123	40 - 140	7	30		
4-Nitrophenol	123	113	30 - 130	9	30		
Acenaphthene	109	94	40 - 140	14	30		
Acenaphthylene	109	95	40 - 140	14	30		
Acetophenone	101	90	40 - 140	12	30		

MJW 9/4/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Lab Control Sample/
Lab Control Sample Duplicate Recovery Report - Batch: 360-92527

Method: 8270D
Preparation: 3546

LCS Lab Sample ID:	LCS 360-92527/2-A	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Client Matrix:	Solid	Prep Batch:	360-92527	Lab File ID:	B18000.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.00 g
Analysis Date:	07/02/2012 2100	Units:	ug/Kg	Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL
Leach Date:	N/A				

LCSD Lab Sample ID:	LCSD 360-92527/3-A	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Client Matrix:	Solid	Prep Batch:	360-92527	Lab File ID:	B18001.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.00 g
Analysis Date:	07/02/2012 2133	Units:	ug/Kg	Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL
Leach Date:	N/A				

	% Rec.						
Analyte	LCS	LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Aniline	44	38	40 - 140	13	30		*
Anthracene	121	105	40 - 140	14	30		
Atrazine	115	107	40 - 140	8	30		
Azobenzene	129	102	40 - 140	24	30		
Benzaldehyde	88	73	40 - 140	19	30		
Benzo[a]anthracene	142	131	40 - 140	8	30	*	
Benzo[a]pyrene	113	96	40 - 140	16	30		
Benzo[b]fluoranthene	134	152	40 - 140	12	30		*
Benzo[g,h,i]perylene	116	99	40 - 140	16	30		
Benzo[k]fluoranthene	93	84	40 - 140	9	30		
Benzoic acid	62	58	30 - 130	6	30	J	J
Benzophenone	102	81	40 - 140	23	30		
Benzyl alcohol	116	106	30 - 130	10	30		
Bis(2-chloroethoxy)methane	108	91	40 - 140	18	30		
Bis(2-chloroethyl)ether	98	87	40 - 140	12	30		
Bis(2-ethylhexyl) phthalate	131	114	40 - 140	14	30		
Butyl benzyl phthalate	110	97	40 - 140	12	30		
Caprolactam	117	91	40 - 140	25	30		
Carbazole	152	130	40 - 140	16	30	*	
Chrysene	103	82	40 - 140	22	30		
Dibenz(a,h)anthracene	114	99	40 - 140	14	30		
Dibenzofuran	122	106	40 - 140	14	30		
Diethyl phthalate	125	108	40 - 140	14	30		
Dimethyl phthalate	119	104	40 - 140	14	30		
Di-n-butyl phthalate	191	159	40 - 140	18	30	*	*
Di-n-octyl phthalate	115	126	40 - 140	9	30		
Fluoranthene	153	119	40 - 140	25	30	*	
Fluorene	111	100	40 - 140	11	30		
Hexachlorobenzene	139	113	40 - 140	20	30		
Hexachlorobutadiene	97	86	40 - 140	13	30		
Hexachlorocyclopentadiene	53	53	40 - 140	0	30		
Hexachloroethane	102	86	40 - 140	17	30		
Indeno[1,2,3-cd]pyrene	108	96	40 - 140	12	30		
Isophorone	90	76	40 - 140	16	30		
Naphthalene	89	78	40 - 140	12	30		
Nitrobenzene	105	91	40 - 140	14	30		

MW 9/4/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Method Blank - Batch: 360-92527

Method: 8270D
Preparation: 3546

Lab Sample ID:	MB 360-92527/1-A	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Client Matrix:	Solid	Prep Batch:	360-92527	Lab File ID:	B17999.D
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	30.00 g
Analysis Date:	07/02/2012 2028	Units:	ug/Kg	Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Benzo[k]fluoranthene	ND		10	33
Benzoic acid	ND		15	170
Benzophenone	ND		10	33
Benzyl alcohol	ND		28	67
Bis(2-chloroethoxy)methane	ND		10	33
Bis(2-chloroethyl)ether	ND		10	33
Bis(2-ethylhexyl) phthalate	16.5	J	10	67
Butyl benzyl phthalate	ND		10	33
Caprolactam	ND		10	33
Carbazole	ND		10	33
Chrysene	ND		10	33
Dibenz(a,h)anthracene	ND		10	33
Dibenzofuran	ND		10	33
Diethyl phthalate	ND		10	33
Dimethyl phthalate	ND		10	33
Di-n-butyl phthalate	185		29	67
Di-n-octyl phthalate	ND		17	33
Fluoranthene	ND		10	33
Fluorene	ND		10	33
Hexachlorobenzene	ND		10	33
Hexachlorobutadiene	ND		10	33
Hexachlorocyclopentadiene	ND		10	67
Hexachloroethane	ND		10	33
Indeno[1,2,3-cd]pyrene	ND		10	33
Isophorone	ND		10	33
Naphthalene	ND		10	33
Nitrobenzene	ND		10	33
N-Nitrosodi-n-propylamine	ND		10	33
N-Nitrosodiphenylamine	ND		10	33
Pentachlorophenol	ND		10	33
Phenanthrene	ND		10	33
Phenol	ND		17	33
Diphenyl oxide	ND		10	33
Pyrene	ND		10	33
Diphenylamine	ND		10	33

Surrogate	% Rec	Acceptance Limits
2,4,6-Tribromophenol	92	30 - 130
2-Fluorobiphenyl	69	30 - 130
2-Fluorophenol	79	30 - 130
Nitrobenzene-d5	81	30 - 130
Phenol-d5	74	30 - 130
Terphenyl-d14	98	30 - 130

MJW 9/4/12

OLIN-WILMINGTON
CHEMIST REVIEW
STANDARD OPERATING PROCEDURE AND CHECKLIST
N-NITROSODIMETHYLAMINE (NDMA) AND
N-NITROSODI-N-PROPYLAMINE (NDPA) BY METHOD 521
SW

Reviewer/Date Mike WASHBURN 9/4/12
Sr. Review/Date Tim Richards 10/31/12
Lab Report # 360-41200
Project 6107120016

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? Check items received. **Yes** [✓] No [ ] N/A [ ] Comments:

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☐ *Sample identification – Field and Laboratory*

Client Information: ☐ *Name* ☐ *Address* ☐ *Client Contact* *(IDs must be cross-referenced)*

☑ Data Package Narrative ☑ results and QC summaries ☑ raw data ☑ chromatograms

ACTION: If no, contact lab for submission of missing or illegible information.

1.1 Laboratory Case Narrative:

Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.2 Chain of Custody (COC) copy present of completed COC? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include a copy of the completed Chain of Custody forms containing all samples in this SDG?

ACTION: If no, contact lab for submission of missing completed *COC*.

1.3 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☐ Condition observed ☑ Field and lab IDs cross referenced documentation. **ACTION**: If no, contact lab for submission of missing or incomplete documentation.

1.3.1 Were the correct bottles and preservatives used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water - 1 Liter amber bottle cool to 4°C. Sodium thiosulfate may be added if source is chlorinated.

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) if cooler temperature exceeds 10°C or use professional judgment for data rejection.

1.3.2 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.3.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.4 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

OLIN-WILMINGTON
CHEMIST REVIEW
STANDARD OPERATING PROCEDURE AND CHECKLIST
N-NITROSODIMETHYLAMINE (NDMA) AND
N-NITROSODI-N-PROPYLAMINE (NDPA) BY METHOD 521

☐ Field ID and Lab ID ☐ *Date and time collected* ☐ Analyst Initials ☐ *Dilution Factor* ☐ *Reporting limits*
☐ Analysis method ☐ *Preparation method* ☐ *Date of preparation/extraction/ and analysis,* ☐ Matrix ☐ Target analytes and concentrations ☐ Units

ACTION: If no, contact lab for submission of missing or incomplete information.

1.5 QA/QC Information: Was the following information provided in the laboratory report for each sample batch?

Yes [ ] No [ ] Comments:

☐ Method blank results ☐ LCS recoveries ☐ MS/MSD recoveries and RPDs ☐ Internal Standard Recoveries

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [ ] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded?

NOTE: For water samples, the holding time is 7 days from sampling to extraction and 40 days from extraction to analysis.

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. For soil samples professional judgement will be used to determine if rejection is necessary.

3.0 Laboratory Method — **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

Water Extraction 3510C or *3520C*
NDMA and NDPA 521 MODIFIED 521 TAL-SOP WS-MS-001

ACTION: If no, contact project manager to inform Client of change; request variance from Client; contact laboratory to provide justification for method change compared to the requested method.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP — **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *The project PQL is 2 ng/L for GW and 5 ng/L for SW.*

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Did the laboratory complete a mulit-point initial calibration with a NDMA ~~RPD~~ RSD* ≤ 20? Is NDPA ~~RPD~~ RSD* ≤ 30? Is the low point standard equal to the PQL? **Yes** [✓] No [ ] Comments:

Has a second source standard been analyzed to verify initial calibration? *MJW 9/4/12 **Yes** [✓] No [ ]
Is the percent difference < 25?

3.4 Did the laboratory analyze a continuing calibration every 12 hours or every 20 samples? Was the NDMA recovery 80-120 percent (percent difference ≤ 20)? Was the NDPA recovery 70 -130 percent (percent difference ≤ 30)? **Yes** [✓] No [ ]

3.5 Is the RRT in the CCAL ± 0.06 min from ICAL? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 For the analysis of NDMA, has a method blank been analyzed for each analysis batch of field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL?

Yes [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for NDMA parameters? Qualify data according to the following:

Yes [ ] **No** [✓] N/A [ ] Comments:

For NDMA contaminants:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

5.0 Laboratory Control Sample

5.1 Was a laboratory control sample extracted and run with each analytical batch of 20 samples or less?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgment to determine the usability of sample results associated with that batch.

5.2 Is a LCS Summary Form present?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of control limits?

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: QAPP LCS recovery limits 60-140.

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but > 10%, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project specified MS/MSDs analyzed? List project samples that were spiked.

Yes [ ] No [✓] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD recovery form present?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission.

6.4 Are any NDMA spike recoveries outside of the QC limits? Yes [ ] No [ ] N/A [✓] Comments:

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$

Where: SSR = Spiked sample result SA = Spike added
SR = Sample result

NOTE: *QAPP MS/MSD recovery limits are 60-140.*

NOTES: 1) Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: Professional judgment used to qualify associated samples. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify both positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: *QAPP MS/MSD RPD limits for water* ≤ 20.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Isotope IS Recoveries

Were internal recoveries outside of laboratory limits for any sample or method blank? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: *Lab IS recovery limits 25 -150.*

ACTION: If recoveries are <10% and sample extracts were not diluted, reject non-detects and qualify positive detections as estimated (J). For recoveries outside the lab QC limit, qualify non-detects and positives (J).

8.0 Sampling Accuracy

If ground water samples are collected directly from a tap, process stream, or with dedicated tubing, rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of the samples and their associated field duplicates. **Yes** [ ] No [✓] N/A [ ] Comments:

9.2 Was the RPD ≤ 30% for waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: RPD must be ≤30% for water. Qualify data (J) for both sample results if the RPD exceeds 30%.

10.0 Calculation and Transcription Checks

- ☐ Initial Calibration
- ☐ Continuing Calibration
- ☐ Method Blank Raw Data Reveiw
- ☐ Sample NDMA and NDPA Results
- ☐ LCS
- ☐ Internal Standard Recovery

9/4/12

REFERENCES

MACTEC, 2009, "Project Operation Plan Volume III-B Quality Assurance Project Plan, Olin Wilmington Superfund Site, 51 Eames Street, Wilmington, MA", April 2009.

U.S. Environmental Protection Agency (USEPA), 1996. "Region 1 EPA-NE Data Validation Guidelines For Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7 /6020

SW

Reviewer/Date Mike Washburn 9/5/12
Sr. Review/Date Cinq Ricardi 10/31/12
Lab Report # 360-41200
Project # 36170120018

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

[✓] *Name of Laboratory* [✓] *Address* [✓] *Project ID* [✓] *Phone #* [✓] *Sample identification – Field and Laboratory*
Client Information: [✓] *Name* [✓] *Address* [✓] *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

[✓] *Narrative serves as an exception report for the project and method QA/QC performance.* [✓] *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes** [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☐ *Reporting limits*
NA *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☐ MS/MSD recoveries and RPDs NA ☐ Laboratory duplicate results (where applicable) NA

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes [✓]** No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7 C

most current method

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes [✓]** No [ ] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

~~Cr~~ Fe - 21.6 Sx = 108
K - 498 Sx = 2490
Mn - 1.31 Sx = 6.55

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [ ] No [✓] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [ ] No [ ] N/A [✓] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [ ] **No** [✓] N/A [✓] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

SOW ☐ QAPP *(1 per 10)* ☐ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No** [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes [ ] **No** [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Method Blank - Batch: 360-92236

Method: 6010C
Preparation: 3010A

Lab Sample ID:	MB 360-92236/1-A	Analysis Batch:	360-92308	Instrument ID:	Varian ICP
Client Matrix:	Water	Prep Batch:	360-92236	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	50 mL
Analysis Date:	06/22/2012 1648	Units:	ug/L	Final Weight/Volume:	50 mL
Prep Date:	06/22/2012 0945				
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Aluminum	ND		13	100
Arsenic	ND		3.3	10
Barium	ND		2.5	10
Beryllium	ND		0.079	1.0
Calcium	ND		54	400
Cadmium	ND		0.24	1.0
Cobalt	ND		1.2	10
Chromium	ND		0.53	5.0
Iron	21.6	J	12	100
Potassium	498	J	360	4000
Magnesium	ND		40	400
Manganese	1.31	J	0.81	10
Sodium	ND		700	2000
Nickel	ND		1.5	10
Antimony	ND		3.8	6.0
Selenium	ND		3.8	10
Tin	ND		4.1	50
Thallium	ND		2.4	10
Vanadium	ND		1.3	10
Zinc	ND		7.2	50

MJW
9/5/12

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

SED

Reviewer/Date Mike Washburn 9/5/12
Sr. Review/Date Chris Ricard 10/31/12
Lab Report # 360-41203
Project # 610712001.8

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☐ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☐ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes** [✓] No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☐ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☐ Container type noted ☐ sample condition observed ☐ pH verified (where applicable) ☐ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes** [✓] No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☐ Field ID and Lab ID ☐ *Date and time collected* ☐ Analyst Initials ☐ *Dilution Factor* ☐ % moisture or solids ☐ *Reporting limits*
☐ *Clean-up method* ☐ Analysis method ☐ *Preparation method* ☐ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☐ Matrix ☐ Target analytes and concentrations ☐ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☐ MS/MSD recoveries and RPDs ☑ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes** [✓] No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

C use most current

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

		5x
If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.	Ca - 7.66	38.3
	fe - 2.6	13
If the sample concentration is > 5 × blank value, no qualification is needed.	Mg - 2.01	10.05
	Sn - 1.29	6.45

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

Lab ran LCS against certified reference material

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [ ] No [✓] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [ ] No [ ] N/A [✓] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [ ] **No** [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

SOW ☐ QAPP *(1 per 10)* ☐ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No** [✓] N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Method Blank - Batch: 360-92320

Method: 6010C
Preparation: 3050B

Lab Sample ID:	MB 360-92320/1-A	Analysis Batch:	360-92426	Instrument ID:	Varian ICP
Client Matrix:	Solid	Prep Batch:	360-92320	Lab File ID:	N/A
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	2.0 g
Analysis Date:	06/26/2012 1401	Units:	mg/Kg	Final Weight/Volume:	100 mL
Prep Date:	06/25/2012 1221				
Leach Date:	N/A				

Analyte	Result	Qual	MDL	RL
Aluminum	ND		0.34	2.5
Silver	ND		0.026	0.50
Arsenic	ND		0.11	1.0
Barium	ND		0.12	0.50
Beryllium	ND		0.0019	0.20
Calcium	7.66	J	3.2	10
Cadmium	ND		0.0066	0.20
Cobalt	ND		0.047	0.50
Chromium	ND		0.12	0.50
Copper	ND		0.14	1.0
Iron	2.60	J	1.8	5.0
Potassium	ND		5.2	200
Magnesium	2.01	J	0.83	10
Manganese	ND		0.051	1.0
Sodium	ND		37	100
Nickel	ND		0.072	1.0
Lead	ND		0.049	0.50
Antimony	ND		0.20	0.50
Selenium	ND		0.24	0.50
Tin	1.29	J	0.42	5.0
Thallium	ND		0.15	1.0
Vanadium	ND		0.038	0.50
Zinc	ND		0.21	2.5

MJW
6/5/12

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
MERCURY BY METHOD 7470A / 7471A / EPA 245.1

SW

Reviewer/Date Mike Washburn 9/5/12
Sr. Review/Date CM Ricault 10/31/12
Lab Report # 360-41200
Project # 610712001B

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not always list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Sample identification – Field and Laboratory*

Client Information: ☑ *Name* ☐ *Address* ☑ *Phone #* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative:** Are both of the following statements true?* ***Yes [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of missing original COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☐ Container type noted ☑ Custody seals checked ☑ Condition observed ☐ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Water - 1 Liter polyethylene/HNO_3 to pH<2, cool to 4°C
Soil - 8 oz soil jar/cool to 4°C

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☑ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for mercury is 28 days from sample collection to analysis for both water and soil.

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used?

Yes [✓] No [ ] N/A [ ] Comments:

Mercury (extracts, aqueous wastes, surface & ground waters)	7470A
Mercury (soil, sediments, bottom deposits, sludges)	7471A
Mercury (drinking, surface, saline waters; wastes)	245.1

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP ? **Yes [✓]** No [ ] N/A [ ] Comments:

Sample Type	***MADEP PQL***	QAPP PQL	Method
Water	-	0.2 µg/L	245.1
Water (GW-3)	***1 µg/L***	0.2 µg/L	7470A
Soil (S-1 & GW-1)	***20 mg/Kg***	0.04 mg/Kg	7471A

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate results present for each sample in the SDG? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.4 Do any method/instrument/reagent blanks have positive results for mercury? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

If the sample concentration is < 5 x blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

ACTION: If yes, contact laboratory to redigest and reanalyze all associated samples unless all detected results are > 5× method blank level. Otherwise, list contaminants for each method blank including the concentration detected and flagging levels (flagging level = 5 × blank value) on the checklist for any blank with positive results. List all affected samples and their qualifiers.

5.0 Laboratory Control Standard

5.1 Is an LCS Summary Form present? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.2 Was a laboratory control standard (LCS) run with each digestion batch of < 20 field samples? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for LCS form submittal. If none, redigest/ reanalyze all associated samples. If the data is not available, reject (R) data associated with that batch. Narrate non-compliance.

5.3 Is the recovery of mercury outside of control limits? Yes [ ] **No [✓]** N/A [ ] Comments:

Note: MADEP QA/QC lists the recommended LCS recovery limits.

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*N/A*	80-120	245.1
Water	***80-120***	80-120	7470A
Soil	Lab limits	80-120	7471A

AQUEOUS ACTION: If yes, and recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but ≥ 50%, qualify all positive results and non-detects within the batch as (J). If the LCS recovery is < 50%, both positive and non-detect results are unusable (R). Narrate non-compliance.

SOLID ACTION: If yes, and recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive results and non-detects within the batch as (J). Unusable (R) qualification of solid positive and non-detect results due to LCS failures is not required. Narrate non-compliance.

6.0 Matrix Spikes

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

ACTION: If no, contact senior chemist to see if any were specified.

Yes [ ] No [✓] N/A [ ] Comments:

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per digestion batch of < 20 field samples?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Were any mercury spike recoveries outside of the recovery limits? Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*N/A*	75-125	245.1
Water	***75-125***	75-125	7470A
Soil	***75-125***	50-150	7471A

NOTE: % Recovery = $\frac{\text{(spiked sample result – sample result)}}{\text{(spike amount added)}} \times 100\%$

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP*** ***RPD***	QAPP RPD	Method
Water	*N/A*	20	245.1
Water	***20***	20	7470A
Soil	***35***	20	7471A

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

ACTION: If the RPD exceeds the control limit, qualify both positive results and non-detects (J). Narrate non-compliance.

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

7.0 Laboratory Duplicate Sample

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the mercury result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinseate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinseate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to the table below.

Sample conc. < 5x blank value:	Sample conc. > 5x blank value:
Flag sample result "U"	No qualification is needed

NOTE: *MADEP does not require the collection of rinseate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [ ] **No** [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

SOW ☐ QAPP ☐ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Application of Validation Qualifiers

If data tables have not been produced, apply data qualifiers directly to DQE copy of laboratory report and **flag pages** for entry in database. **Yes** [ ] No [✓] N/A [ ] Comments:

no data validation actions

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

USEPA, 1988. "Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analysis," EPA/540/R-94-012 and EPA/540-R-94-013, July 1988.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Control Requirements and Performance Standards for the Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA) Spectrometry in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Section IIIB, Final, Revision No. 1, 1 July 2010.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
MERCURY BY METHOD 7470A / 7471A / EPA 245.1

SED

Reviewer/Date Mike Washburn 9/5/12
Sr. Review/Date Chris Richards 10/31/12
Lab Report # 360-41203
Project # 6107120018

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not always list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Sample identification – Field and Laboratory*

Client Information: ☑ *Name* ☑ *Address* ☑ *Phone #* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

***1.3 Laboratory Case Narrative:** Are both of the following statements true?* **Yes** [✓] No [ ] N/A [ ] Comments:

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of missing original COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes [✓]** No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Custody seals checked ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used? **Yes [✓]** No [ ] N/A [ ] Comments:

Water - 1 Liter polyethylene/HNO_3 to pH<2, cool to 4°C
Soil - 8 oz soil jar/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage? **Yes [✓]** No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No [✓]** N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes [✓]** No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☑ *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes [✓]** No [ ] N/A [ ] Comments:

☐ Method blank results ☐ LCS recoveries ☐ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for mercury is 28 days from sample collection to analysis for both water and soil.

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used?

Yes [✓] No [ ] N/A [ ] Comments:

Mercury (extracts, aqueous wastes, surface & ground waters)	7470A
Mercury (soil, sediments, bottom deposits, sludges)	7471A ✓
Mercury (drinking, surface, saline waters; wastes)	245.1

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP ? **Yes** [✓] No [ ] N/A [ ] Comments:

Sample Type	***MADEP PQL***	QAPP PQL	Method
Water	-	0.2 µg/L	245.1
Water (GW-3)	***1 µg/L***	0.2 µg/L	7470A
Soil (S-1 & GW-1)	***20 mg/Kg***	0.04 mg/Kg	7471A

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.4 Do any method/instrument/reagent blanks have positive results for mercury? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

If the sample concentration is < 5 x blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

ACTION: If yes, contact laboratory to redigest and reanalyze all associated samples unless all detected results are > 5× method blank level. Otherwise, list contaminants for each method blank including the concentration detected and flagging levels (flagging level = 5 × blank value) on the checklist for any blank with positive results. List all affected samples and their qualifiers.

5.0 Laboratory Control Standard

5.1 Is an LCS Summary Form present? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.2 Was a laboratory control standard (LCS) run with each digestion batch of < 20 field samples? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for LCS form submittal. If none, redigest/ reanalyze all associated samples. If the data is not available, reject (R) data associated with that batch. Narrate non-compliance.

5.3 Is the recovery of mercury outside of control limits? Yes [ ] **No [✓]** N/A [ ] Comments:

Note: MADEP QA/QC lists the recommended LCS recovery limits.

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*N/A*	80-120	245.1
Water	***80-120***	80-120	7470A
Soil	Lab limits	80-120	7471A

AQUEOUS ACTION: If yes, and recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit but ≥ 50%, qualify all positive results and non-detects within the batch as (J). If the LCS recovery is < 50%, both positive and non-detect results are unusable (R). Narrate non-compliance.

SOLID ACTION: If yes, and recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive results and non-detects within the batch as (J). Unusable (R) qualification of solid positive and non-detect results due to LCS failures is not required. Narrate non-compliance.

6.0 Matrix Spikes

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.
ACTION: If no, contact senior chemist to see if any were specified.
Yes [ ] No [✓] N/A [ ] Comments:

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?
Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per digestion batch of < 20 field samples?
Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Were any mercury spike recoveries outside of the recovery limits? Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP*** ***% Rec***	QAPP % Rec	Method
Water	*N/A*	75-125	245.1
Water	***75-125***	75-125	7470A
Soil	***75-125***	50-150	7471A

NOTE: % Recovery = $\frac{\text{(spiked sample result – sample result)}}{\text{(spike amount added)}} \times 100\%$

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

Sample Type	***MADEP RPD***	QAPP RPD	Method
Water	*N/A*	20	245.1
Water	***20***	20	7470A
Soil	***35***	20	7471A

NOTE: RPD = $\frac{S-D}{(S+D)/2}$ x 100% Where: S = MS sample result
D = MSD sample result

ACTION: If the RPD exceeds the control limit, qualify both positive results and non-detects (J). Narrate non-compliance.

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

7.0 Laboratory Duplicate Sample

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the mercury result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinseate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinseate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to the table below.

Sample conc. < 5x blank value:	Sample conc. > 5x blank value:
Flag sample result "U"	No qualification is needed

***NOTE**: MADEP does not require the collection of rinseate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [ ] **No** [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

SOW ☐ QAPP ☐ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Application of Validation Qualifiers

If data tables have not been produced, apply data qualifiers directly to DQE copy of laboratory report and **flag pages** for entry in database. **Yes** [ ] No [✓] N/A [ ] Comments:

no Data flag generated

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

USEPA, 1988. "Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analysis," EPA/540/R-94-012 and EPA/540-R-94-013, July 1988.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Control Requirements and Performance Standards for the Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA) Spectrometry in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Section IIIB, Final, Revision No. 1, 1 July 2010.

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS
Surface Water

Reviewer/Date Mike Washburn 8/30/12
Sr. Review/Date Cindy Lucas 10/31/12
Lab Report # 360-41200-1
Project # 6107120016

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☐ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

Yes [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Field ID and Lab ID
- [✓] Date and time collected
- [✓] Analyst Initials
- [✓] Dilution Factor
- [N/A] % moisture or solids
- [✓] Reporting limits
- [N/A] *Clean-up method*
- [✓] Analysis method
- [✓] Preparation method
- [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
- [✓] Matrix
- [✓] Target analytes and concentrations
- [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [ ] No [ ] N/A [ ] Comments:

- [✓] Method blank results
- [✓] LCS recoveries
- [✓] MS/MSD recoveries and RPDs
- [ ] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days | Sulfide, TDS, TSS = 7 days | pH = analyze immediately | Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs | Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [ ] No [✓] N/A [ ] Comments: elevated limits due to dilution bromide 0.1 vice 0.01

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☐ = 0.1 mg/ L	Alkalinity** ☐ = 1 mg/L	Bicarbonate Alkalinity** ☐ = 1 mg/L	Carbonate Alkalinity** ☐ = 1 mg/L
Nitrate Nitrogen as N* ☑ = .05 mg/L	Nitrite Nitrogen as N* ☑ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness * ☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☐ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) bromide PQL = 0.01 ☑ Source of PQL = QAPP

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 <u>Method Blanks</u> **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes** [✓] No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No** [✓] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☐ = 80-120%	Carbonate Alkalinity** ☐ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☑ = 80-120%	TDS** ☐ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☑ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N** ☑ = 80-120%	Nitrite Nitrogen as N** ☑ = 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) bromide %R = 80-120 ☑ Rec Limits= QAPP

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SW-EPSD/SW 7-XXX

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [ ] **No** [✓] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☐ = 75-125%
Chloride*(SM 4500 Cl) ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☑ = 75-125%
Nitrite Nitrogen as N** ☑ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) bromide % R = 75-125 ☑ Rec Limits = QAPP

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: $RPD = \frac{S - D}{(S + D)/2} \times 100\%$ Where S = MS result
D = MSD result

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [ ] No [ ] N/A [✓] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [ ] No [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

QAPP/IRSWP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [ ] **No** [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

Anion, AA Ammonia, TOC

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS
SEDIMENT

Reviewer/Date Mike Washburn 8/30/12
Sr. Review/Date Chris Ricault 10/31/12
Lab Report # 360-41203-1
Project # 610712001G

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☐ *Phone #* ☐ *Sample identification – Field and Laboratory*

Client Information: ☑ *Name* ☑ *Address* ☐ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

ANIONS, AMMONIA, TOC

Yes [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☐ pH verified (where applicable) ☐ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] **No** [✓] N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?* **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Field ID and Lab ID
- [✓] Date and time collected
- [✓] Analyst Initials
- [✓] Dilution Factor
- [✓] % moisture or solids
- [✓] Reporting limits
- [NA] *Clean-up method*
- [✓] Analysis method
- [✓] Preparation method
- [✓] Date of preparation/extraction/digestion clean-up and analysis, where applicable
- [✓] Matrix
- [✓] Target analytes and concentrations
- [✓] Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

- [✓] Method blank results
- [✓] LCS recoveries
- [✓] MS/MSD recoveries and RPDs
- [NA] Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days | Sulfide, TDS, TSS = 7 days | pH = analyze immediately | Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs | Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☑ QAPP/IRSWP ☐ Lab? **Yes** [ ] No [ ] N/A [✓] Comments: (1) changed PQL to reflect solid media vice water. Sed RLs not defined

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses, therefore all criteria will default to values stipulated in the QAPP*. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☑ ~~= 0.1~~ 5 (1) mg/ L	Alkalinity** ☐ = 1 mg/L	Bicarbonate Alkalinity** ☐ = 1 mg/L	Carbonate Alkalinity** ☐ = 1 mg/L
Nitrate Nitrogen as N* ☐ ~~= .05~~ 5 (1) mg/L	Nitrite Nitrogen as N* ☑ ~~= .01~~ 1 (1) mg/L	Chloride* ☑ ~~= 1~~ 20 (1) mg/L	Hardness * ☐ = 2 mg/L
Spec. Cond.** ☐ 3 umhos/cm	Total Organic Carbon** ☐ ~~= 1~~ 1000 (1) mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☐ ~~= 2~~ 40 (1) mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☐ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) bromide PQL = 20 ☑ Source of PQL = QAPP

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 <u>Method Blanks</u> **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes [✓]** No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No [✓]** N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☐ = 80-120%	Carbonate Alkalinity** ☐ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☑ = 80-120%	TDS** ☐ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☑ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N** ☑ = 80-120%	Nitrite Nitrogen as N** ☑ = 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) Bromide %R = 80-120 ☑ Rec Limits= QAPP

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SO-EDSD/SW7-XXX

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD Recovery Form present?

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

Yes [ ] **No** [☑] N/A [ ] Comments:

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result
SR = Sample result
SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (LACHAT) ☑ = 75-125%
Chloride*(SM 4500 Cl) ☐= 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☐ = 75-125%
Nitrite Nitrogen as N** ☐ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☐ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S - D}{(S + D)/2} \times 100\%$ Where S = MS result
D = MSD result

Yes [ ] **No [☑]** N/A [ ] Comments:

MS/MSD RPD Limits:

RPD ≤ 20 RPD ≤ 35 for solids

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [ ] No [ ] N/A [☑] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☐ = 5% TSS** ☐ = 6% TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [ ] No [✓] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [ ] No [ ] N/A [✓] Comments:

QAPP/IRSWP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [ ] No [ ] N/A [✓] Comments:

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [ ] **No** [✓] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

PROJECT CHEMIST REVIEW RECORD

Method : 8315A Formaldehyde/Acetaldehyde, LC65 Phthalic anhydride

Laboratory and Lot : TAL 360-41203

Date: 9/5/2012

Reviewer: Mike WASHBURN

1. Case Narrative

   reviewed

2. Holding time and Sample Collection

   within QC limits

3. QC Blanks

   no detections

4. Laboratory Control Sample Results (Form/ace (80-120)) (phtalic (60-140))

   within QC limits

5. Surrogate (if applicable)

   NA

6. Field Duplicate Precision

   NA

7. Matrix Spike Results (if applicable) (Formace (75-125)) (Phthalic (60-140))

   ~~NA~~ Acetaldehyde - 70/69

8. Reporting Limits and Data Completeness

   Verified

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Laboratory Control/
Laboratory Duplicate Data Report - Batch: 640-93608

Method: 8315A
Preparation: 8315_S_Prep

LCS Lab Sample ID:	LCS 640-93608/2-A	Units: ug/Kg	LCSD Lab Sample ID:	LCSD 640-93608/3-A
Client Matrix:	Solid		Client Matrix:	Solid
Dilution:	1.0		Dilution:	1.0
Analysis Date:	06/21/2012 1138		Analysis Date:	06/21/2012 1150
Prep Date:	06/21/2012 0746		Prep Date:	06/21/2012 0746
Leach Date:	N/A		Leach Date:	N/A

Analyte	LCS Spike Amount	LCSD Spike Amount	LCS Result/Qual	LCSD Result/Qual
Formaldehyde	750	750	776	805
Acetaldehyde	750	750	677	697

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 640-93608

Method: 8315A
Preparation: 8315_S_Prep

MS Lab Sample ID:	360-41203-1	Analysis Batch:	640-93636	Instrument ID:	LCM
Client Matrix:	Solid	Prep Batch:	640-93608	Lab File ID:	1F21M7.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	20.0 g
Analysis Date:	06/21/2012 1214			Final Weight/Volume:	4.0 mL
Prep Date:	06/21/2012 0746			Injection Volume:	10 uL
Leach Date:	N/A				

MSD Lab Sample ID:	360-41203-1	Analysis Batch:	640-93636	Instrument ID:	LCM
Client Matrix:	Solid	Prep Batch:	640-93608	Lab File ID:	1F21M8.d
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	20.4 g
Analysis Date:	06/21/2012 1226			Final Weight/Volume:	4.0 mL
Prep Date:	06/21/2012 0746			Injection Volume:	10 uL
Leach Date:	N/A				

Analyte	% Rec. MS	% Rec. MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Formaldehyde	95	101	31 - 131	2	30		
Acetaldehyde	70	69	30 - 130	2	30		

MJW
9/6/12

PROJECT CHEMIST REVIEW RECORD

Method : 8315A MOD - Hydrazine

Laboratory and Lot : OLN 78

Date: 9/7/12

Reviewer: Mike Washburn

1. Case Narrative

   reviewed

2. Holding time and Sample Collection

   within limits

3. QC Blanks

   no detections

4. Laboratory Control Sample Results (70-130)

   ^
   within QC standards

5. Surrogate (if applicable)

   NA

6. Field Duplicate Precision

   NA

7. Matrix Spike Results (if applicable) (40-140)

   Methyl hydrazine (MMH) - 6/6

   1,1 - dimethyl hydrazine (UDMH) - 14/16

   * Not qualified due to judgment

8. Reporting Limits and Data Completeness

   Verified

eurofins | Lancaster Laboratories

Quality Control Summary
Matrix Spike/Matrix Spike Duplicate

SDG: OLN78
Matrix: SOLID

Specialty Services Group
Fraction: Hydrazines by LC/MS/MS

UNSPK: 6695248 MS: 6695248 MSD: 6695248 **Analyte**	Batch: **12173001** (Sample number(s): 6695248)								
	Spike Added ng/g	**Unspiked Conc ng/g**	**MS Conc ng/g**	**MSD Conc ng/g**	**MS %Rec**	**MSD %Rec**	**%Rec Limits**	**%RPD**	**%RPD Limits**
Hydrazine	120	1.14	86.84	85.64	71	70	11-102	1	30
Methylhydrazine	600	N.D.	38.86	36.39	6 *	6 *	10-92	7	30
1,1-Dimethylhydrazine	600	N.D.	85.47	97.3	14	16	10-116	13	30

Results are being reported on an as received basis.

7/3/2012 10:46:27 AM

MJW 9/7/12

OLN78 0816

eurofins | Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Type I Data Package

Prepared for:

Olin Corporation
Suite 200
3855 North Ocoee Street
Cleveland TN 37312

Project: Olin Wilmington, MA / 6107120016
Water Sample
Collected on 06/18/12

SDG# OLN77

GROUP	SAMPLE NUMBERS
1316839	6693008

PA Cert. # 36-00037
NY Cert. # 10670
NJ Cert. # PA011
NC Cert. # 521
TX Cert. # T104704194-08A-TX

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client.

Authorized by: Dana M Kauffman **Date: 07/09/2012**

Dana M. Kauffman
Manager

CHECKED FOR COMPLETENESS OF PARAMETERS ORDERED BY:

Any questions or concerns you might have regarding this data package should be directed to your client representative, Nicole Maljovec at Ext. 1537.

Total Number of Pages __118__

PROJECT CHEMIST REVIEW RECORD

Method : SW8033M - DMF

Laboratory and Lot : Katahdin

Date: 9/6/12

Reviewer: Mike Washburn

1. Case Narrative

   Reviewed

2. Holding time and Sample Collection

   within limits

3. QC Blanks

   no Detections

4. Laboratory Control Sample Results (70-130)

   within QC limits

5. Surrogate (if applicable) (70-130)

   ~~NA~~ within QC standards

   MJW 9/6/12

6. Field Duplicate Precision

   NA

7. Matrix Spike Results (if applicable)

   NA

8. Reporting Limits and Data Completeness

   Verified

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid % Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

8260C Volatile Organic Compounds (GC/MS)

Analysis Method:	8260C	Analysis Batch:	360-92620	Instrument ID:	HP #1 GC/MS
Prep Method:	5035	Prep Batch:	360-92619	Lab File ID:	V56959.D
Dilution:	1.0			Initial Weight/Volume:	6.02 g
Analysis Date:	07/02/2012 1756			Final Weight/Volume:	5 g
Prep Date:	07/02/2012 1527				

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane		ND		1.2	2.5
1,1,1-Trichloroethane		ND		1.8	2.5
1,1,2,2-Tetrachloroethane		ND		1.0	2.5
1,1,2-Trichloroethane		ND		1.0	2.5
1,1-Dichloroethane		ND		1.8	2.5
1,1-Dichloroethene		ND		1.6	2.5
1,2,3-Trichloropropane		ND		1.1	2.5
1,2,3-Trichlorobenzene		ND		1.1	2.5
1,2,4-Trichlorobenzene		ND		1.0	2.5
1,2-Dichlorobenzene		ND		1.0	2.5
1,2-Dichloroethane		ND		2.1	2.5
1,3,5-Trimethylbenzene		ND		1.3	2.5
1,3-Dichlorobenzene		ND		1.0	2.5
1,4-Dichlorobenzene		ND		1.0	2.5
1,4-Dioxane		ND		110	250
2,2-Dichloropropane		ND		2.0	2.5
2-Chlorotoluene		ND		1.2	2.5
2-Hexanone		ND	-	14	25
4-Chlorotoluene		ND		1.1	2.5
Acetone		ND	- W	100	250
Benzene		ND		1.7	2.5
Bromobenzene		ND		1.5	2.5
Bromoform		ND		1.6	2.5
Bromomethane		ND		2.3	5.0
Carbon disulfide		ND		1.9	2.5
Carbon tetrachloride		ND		1.7	2.5
Chlorobenzene		ND		1.1	2.5
Chlorobromomethane		ND		1.4	2.5
Chlorodibromomethane		ND		1.2	2.5
1,2-Dibromo-3-Chloropropane		ND		1.4	25
Chloroethane		ND		1.6	5.0
Chloroform		ND		1.5	2.5
Chloromethane		ND		1.4	5.0
cis-1,2-Dichloroethene		ND		1.2	2.5
cis-1,3-Dichloropropene		ND		1.0	2.5
Dibromomethane		ND		1.2	2.5
Dichlorobromomethane		ND		1.3	2.5
Dichlorodifluoromethane		ND		2.1	5.0
Ethylbenzene		ND		1.6	2.5
Ethylene Dibromide		ND		1.1	2.5
Hexachlorobutadiene		ND		1.4	2.5
m-Xylene & p-Xylene		ND		3.0	5.0
2-Butanone (MEK)		ND	-	11	25
4-Methyl-2-pentanone (MIBK)		ND		9.9	25
Methyl tert-butyl ether		ND		1.5	2.5
Methylene Chloride		ND		2.0	10

MJW
~~AHT~~ 9/6/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid
% Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Prep Method:	3546	Prep Batch:	360-92527	Lab File ID:	B18002.D
Dilution:	20			Initial Weight/Volume:	40.38 g
Analysis Date:	07/02/2012 2205			Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
1,1'-Biphenyl		ND		180	600
1,2,4,5-Tetrachlorobenzene		ND		180	600
1,2,4-Trichlorobenzene		ND		180	600
1,2-Dichlorobenzene		ND		180	600
1,3-Dichlorobenzene		ND		180	600
1,4-Dichlorobenzene		ND		180	600
1-Methylnaphthalene		ND		180	600
2,2'-oxybis[1-chloropropane]		ND		180	600
2,3,4,6-Tetrachlorophenol		ND		180	600
2,4,5-Trichlorophenol		ND		180	600
2,4,6-Trichlorophenol		ND		180	600
2,4-Dichlorophenol		ND		180	600
2,4-Dimethylphenol		ND		240	600
2,4-Dinitrophenol		ND		180	600
2,4-Dinitrotoluene		ND		180	600
2,6-Dinitrotoluene		ND		180	600
2-Chloronaphthalene		ND		180	600
2-Chlorophenol		ND		180	600
2-Methylnaphthalene		ND		180	600
2-Methylphenol		ND		360	600
2-Nitroaniline		ND		180	3000
2-Nitrophenol		ND		180	600
3 & 4 Methylphenol		ND		180	600
3,3'-Dichlorobenzidine		ND		180	1200
3-Nitroaniline		ND		180	3000
4,6-Dinitro-2-methylphenol		ND		180	3000
4-Bromophenyl phenyl ether		ND		180	600
4-Chloro-3-methylphenol		ND		180	1200
4-Chloroaniline		ND		180	1200
4-Chlorophenyl phenyl ether		ND		180	600
4-Nitroaniline		ND		180	3000
4-Nitrophenol		ND		180	3000
Acenaphthene		ND		180	600
Acenaphthylene		ND		180	600
Acetophenone		ND		180	600
Aniline		ND		310	600
Anthracene		ND		180	600
Atrazine		ND		180	600
Azobenzene		ND		180	600
Benzaldehyde		ND		180	600
Benzo[a]anthracene		630	J	180	600
Benzo[a]pyrene		670		180	600
Benzo[b]fluoranthene		1000	J	180	600
Benzo[g,h,i]perylene		540	J	180	600
Benzo[k]fluoranthene		450	J	180	600
Benzoic acid		ND		270	3000

MJW
9/6/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid
% Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Prep Method:	3546	Prep Batch:	360-92527	Lab File ID:	B18002.D
Dilution:	20			Initial Weight/Volume:	40.38 g
Analysis Date:	07/02/2012 2205			Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Benzophenone		ND		180	600
Benzyl alcohol		ND		510	1200
Bis(2-chloroethoxy)methane		ND		180	600
Bis(2-chloroethyl)ether		ND		180	600
Bis(2-ethylhexyl) phthalate		1500	B	180	1200
Butyl benzyl phthalate		ND		180	600
Caprolactam		ND		180	600
Carbazole		ND	*	180	600
Chrysene		1000		180	600
Dibenz(a,h)anthracene		ND		180	600
Dibenzofuran		ND		180	600
Diethyl phthalate		ND		180	600
Dimethyl phthalate		ND		180	600
Di-n-butyl phthalate		ND	*	530	1200
Di-n-octyl phthalate		ND		300	600
Fluoranthene		1800	* J	180	600
Fluorene		ND		180	600
Hexachlorobenzene		ND		180	600
Hexachlorobutadiene		ND		180	600
Hexachlorocyclopentadiene		ND		180	1200
Hexachloroethane		ND		180	600
Indeno[1,2,3-cd]pyrene		480	J	180	600
Isophorone		ND		180	600
Naphthalene		ND		180	600
Nitrobenzene		ND		180	600
N-Nitrosodi-n-propylamine		ND		180	600
N-Nitrosodiphenylamine		ND		180	600
Pentachlorophenol		ND		180	600
Phenanthrene		640		180	600
Phenol		ND		310	600
Diphenyl oxide		ND		180	600
Pyrene		1100		180	600
Diphenylamine		ND		180	600

Surrogate	%Rec	Qualifier	Acceptance Limits
2,4,6-Tribromophenol	0	X	30 - 130
2-Fluorobiphenyl	0	X	30 - 130
2-Fluorophenol	0	X	30 - 130
Nitrobenzene-d5	0	X	30 - 130
Phenol-d5	0	X	30 - 130
Terphenyl-d14	0	X	30 - 130

MJW
9/6/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid % Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92604	Instrument ID:	Inst. B
Prep Method:	3546	Prep Batch:	360-92527	Lab File ID:	B18002.D
Dilution:	20			Initial Weight/Volume:	40.38 g
Analysis Date:	07/02/2012 2205			Final Weight/Volume:	1.0 mL
Prep Date:	06/28/2012 1624			Injection Volume:	2 uL

Tentatively Identified Compounds **Number TIC's Found:** 8

Cas Number	Analyte	RT	Est. Result (ug/Kg)	Qualifier
	Unknown	13.36	470	~~T~~ J N
	Unknown	13.39	520	~~T~~ J N
	Unknown	13.43	450	~~T~~ J N
	Unknown	13.45	320	~~T~~ J N
	Unknown	13.51	370	~~T~~ J N
	Unknown	13.54	610	~~T~~ J N
	Unknown	13.57	610	~~T~~ J N
	Unknown	13.62	290	~~T~~ J N

MJW 9/6/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid
% Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

8315A Carbonyl Compounds (HPLC)

Analysis Method:	8315A	Analysis Batch:	640-93636	Instrument ID:	LCM
Prep Method:	8315_S_Prep	Prep Batch:	640-93608	Lab File ID:	1F21M6.d
Dilution:	1.0			Initial Weight/Volume:	20.0 g
Analysis Date:	06/21/2012 1202			Final Weight/Volume:	4.0 mL
Prep Date:	06/21/2012 0746			Injection Volume:	10 uL

Analyte	DryWt Corrected: Y	Result (ug/Kg)	Qualifier	MDL	RL
Formaldehyde		720		95	120
Acetaldehyde		ND	UJ	35	240

MJW
9/6/12

Client: Olin Corporation

Job Number: 360-41203-1
Sdg Number: 360-41203-1

Client Sample ID: **OC-SD-EDSD/SW7-XXX**

Lab Sample ID: 360-41203-1
Client Matrix: Solid
% Moisture: 17.7

Date Sampled: 06/18/2012 1125
Date Received: 06/19/2012 1000

6010C Metals (ICP)

Analysis Method:	6010C	Analysis Batch:	360-92426	Instrument ID:	Varian ICP
Prep Method:	3050B	Prep Batch:	360-92320	Lab File ID:	N/A
Dilution:	2.0			Initial Weight/Volume:	1.96 g
Analysis Date:	06/26/2012 1440			Final Weight/Volume:	100 mL
Prep Date:	06/25/2012 1221				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Aluminum		5900		0.85	6.2
Silver		2.6		0.064	1.2
Arsenic		57		0.28	2.5
Barium		140		0.29	1.2
Beryllium		0.20	J	0.0047	0.50
Calcium		1500	~~B~~	7.9	25
Cadmium		0.84		0.016	0.50
Cobalt		7.2		0.12	1.2
Chromium		39		0.30	1.2
Copper		270		0.34	2.5
Iron		41000	~~B~~	4.5	12
Potassium		290	J	13	500
Magnesium		3300	~~B~~	2.1	25
Manganese		230		0.13	2.5
Sodium		180	J	93	250
Nickel		19		0.18	2.5
Lead		340		0.12	1.2
Antimony		4.0		0.49	1.2
Selenium		ND		0.60	1.2
Tin		~~5.5~~ 12	~~J B~~ U	1.0	12
Thallium		ND		0.37	2.5
Vanadium		16		0.094	1.2
Zinc		450		0.53	6.2

7471A Mercury (CVAA)

Analysis Method:	7471A	Analysis Batch:	360-92258	Instrument ID:	Hg Analyzer
Prep Method:	7471A	Prep Batch:	360-92245	Lab File ID:	062212.PRN
Dilution:	1.0			Initial Weight/Volume:	0.23 g
Analysis Date:	06/22/2012 1505			Final Weight/Volume:	50 mL
Prep Date:	06/22/2012 1019				

Analyte	DryWt Corrected: Y	Result (mg/Kg)	Qualifier	MDL	RL
Mercury		0.040	J	0.025	0.11

MW 9/6/12

PROJECT CHEMIST REVIEW RECORD

Method : SW8000B – OPEX / Kempore

Laboratory and Lot : Lancaster OLN77

Date: 9/6/12

Reviewer: Mike Washburn

1. Case Narrative

   reviewed

2. Holding time and Sample Collection

   OPEX analysis exceeded hold time by 2 day

3. QC Blanks

   no detections

4. Laboratory Control Sample Results (70-130)

   within QC standards

5. Surrogate (if applicable)

   NA

6. Field Duplicate Precision

   NA

7. Matrix Spike Results (if applicable)

   NA

8. Reporting Limits and Data Completeness

   Verified

Sample Description: OC-SW-EDSD/SW7-XXX Grab Water
Wilmington MA Superfund Site

LLI Sample # WW 6693008
LLI Group # 1316839
Account # 12670

Project Name: Olin Wilmington, MA / 6107120016

Collected: 06/18/2012 11:10

Submitted: 06/19/2012 09:30
Reported: 07/06/2012 12:52

Olin Corporation
Suite 200
3855 North Ocoee Street
Cleveland TN 37312

SWEDS SDG#: OLN77-01*

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation*	As Received Method Detection Limit	Dilution Factor
HPLC Organics	SW-846 8000B		ug/l	ug/l	ug/l	
02727	Kempore in Water	123-77-3	N.D.	1,000	230	1
02726	Opex in Water	101-25-7	N.D. UJ	100	100	1

The holding time was not met. The client was notified and the data reported.
Opex was not detected in the MDL verification standard. Therefore, the reporting limit is raised to account for the change in instrument sensitivity.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
02727	Kempore in Water	SW-846 8000B	1	121720024A	06/21/2012 15:28	Michele D Hamilton	1
02726	Opex in Water	SW-846 8000B	1	121740029A	06/27/2012 12:20	James H Place	1

*=This limit was used in the evaluation of the final result

Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Client Sample ID: **OC-SW-EDSD/SW-7-XXX**

Lab Sample ID: 360-41200-1
Client Matrix: Water

Date Sampled: 06/18/2012 1110
Date Received: 06/19/2012 1000

8260C Volatile Organic Compounds (GC/MS)

Analysis Method:	8260C	Analysis Batch:	360-92562	Instrument ID:	HP #3 GC/MS
Prep Method:	5030C	Prep Batch:	N/A	Lab File ID:	V20100.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	06/29/2012 1725			Final Weight/Volume:	5 mL
Prep Date:	06/29/2012 1725				

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1,1,2-Tetrachloroethane	ND		0.20	1.0
1,1,1-Trichloroethane	ND		0.20	1.0
1,1,2,2-Tetrachloroethane	ND		0.20	0.50
1,1,2-Trichloroethane	ND		0.20	1.0
1,1-Dichloroethane	ND		0.20	1.0
1,1-Dichloroethene	ND		0.20	1.0
1,1-Dichloropropene	ND		0.20	1.0
1,2,3-Trichlorobenzene	ND		0.20	1.0
1,2,3-Trichloropropane	ND	UJ	0.20	1.0
1,2,4-Trichlorobenzene	ND		0.20	1.0
1,2,4-Trimethylbenzene	ND		0.20	1.0
1,2-Dibromo-3-Chloropropane	ND		2.0	5.0
1,2-Dichlorobenzene	ND		0.20	1.0
1,2-Dichloroethane	ND		0.20	1.0
1,2-Dichloropropane	ND		0.20	1.0
1,3,5-Trimethylbenzene	ND		0.20	1.0
1,3-Dichlorobenzene	ND		0.20	1.0
1,3-Dichloropropane	ND		0.20	1.0
1,4-Dichlorobenzene	ND		0.20	1.0
1,4-Dioxane	ND		20	50
2,2-Dichloropropane	ND		0.20	1.0
2-Butanone (MEK)	ND		1.3	10
2-Chlorotoluene	ND		0.20	1.0
2-Hexanone	ND		2.0	10
4-Chlorotoluene	ND		0.20	1.0
4-Isopropyltoluene	ND		0.20	1.0
4-Methyl-2-pentanone (MIBK)	ND		2.0	10
Acetone	ND		20	50
Benzene	ND		0.20	1.0
Bromobenzene	ND		0.20	1.0
Bromoform	ND		0.20	1.0
Bromomethane	ND		0.20	2.0
Carbon disulfide	ND		0.20	10
Carbon tetrachloride	ND		0.30	1.0
Chlorobenzene	ND		0.20	1.0
Chlorobromomethane	ND		0.20	1.0
Chlorodibromomethane	ND		0.20	0.50
Chloroethane	ND		0.21	2.0
Chloroform	ND		0.20	1.0
Chloromethane	ND		0.20	2.0
cis-1,2-Dichloroethene	1.1		0.20	1.0
cis-1,3-Dichloropropene	ND		0.20	0.40
Dibromomethane	ND		0.20	1.0
Dichlorobromomethane	ND		0.20	0.50
Dichlorodifluoromethane	ND		0.20	1.0
Ethyl ether	ND		0.20	1.0

MJW
9/5/12

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Client Sample ID: **OC-SW-EDSD/SW-7-XXX**

Lab Sample ID: 360-41200-1
Client Matrix: Water

Date Sampled: 06/18/2012 1110
Date Received: 06/19/2012 1000

8260C Volatile Organic Compounds (GC/MS)

Analysis Method:	8260C	Analysis Batch:	360-92562	Instrument ID:	HP #3 GC/MS
Prep Method:	5030C	Prep Batch:	N/A	Lab File ID:	V20100.D
Dilution:	1.0			Initial Weight/Volume:	5 mL
Analysis Date:	06/29/2012 1725			Final Weight/Volume:	5 mL
Prep Date:	06/29/2012 1725				

Analyte	Result (ug/L)	Qualifier	MDL	RL
Ethylbenzene	ND		0.20	1.0
Ethylene Dibromide	ND		0.20	1.0
Hexachlorobutadiene	ND		0.20	0.40
Isopropyl ether	ND		0.20	10
Isopropylbenzene	ND		0.20	1.0
m-Xylene & p-Xylene	ND		0.50	2.0
Methyl tert-butyl ether	ND		0.20	1.0
Methylene Chloride	ND		1.0	2.0
n-Butylbenzene	ND		0.20	1.0
N-Propylbenzene	ND		0.20	1.0
Naphthalene	ND		2.0	5.0
o-Xylene	ND		0.20	1.0
sec-Butylbenzene	ND		0.20	1.0
Styrene	ND		0.20	1.0
Tert-amyl methyl ether	ND		0.20	5.0
Tert-butyl ethyl ether	ND		0.20	5.0
tert-Butylbenzene	ND		0.20	1.0
Tetrachloroethene	ND		0.20	1.0
Tetrahydrofuran	ND		2.0	10
Toluene	ND		0.20	1.0
trans-1,2-Dichloroethene	ND		0.20	1.0
trans-1,3-Dichloropropene	ND		0.20	0.40
Trichloroethene	ND		0.20	1.0
Trichlorofluoromethane	ND		0.20	1.0
Vinyl chloride	ND		0.20	0.50
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.20	1.0
2,4,4-Trimethyl-1-pentene	ND		0.20	1.0
2,4,4-Trimethyl-2-pentene	ND		0.20	1.0
Cyclohexane	ND		0.20	1.0
Methyl acetate	ND		2.0	20
Methylcyclohexane	ND		0.20	1.0

Surrogate	%Rec	Qualifier	Acceptance Limits
4-Bromofluorobenzene	77		70 - 130
Toluene-d8 (Surr)	85		70 - 130
Dibromofluoromethane	102		70 - 130

MJW
9/5/12

Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Client Sample ID: **OC-SW-EDSD/SW-7-XXX**

Lab Sample ID: 360-41200-1
Client Matrix: Water

Date Sampled: 06/18/2012 1110
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Prep Method:	3510C	Prep Batch:	360-92116	Lab File ID:	B17814.D
Dilution:	1.0			Initial Weight/Volume:	1062 mL
Analysis Date:	06/20/2012 2015			Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1916			Injection Volume:	2 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
1,1'-Biphenyl	ND		0.47	4.7
1,2,4,5-Tetrachlorobenzene	ND		0.47	4.7
1-Methylnaphthalene	ND		0.047	4.7
2,2'-oxybis[1-chloropropane]	ND		0.47	4.7
2,3,4,6-Tetrachlorophenol	ND		0.47	4.7
2,4,5-Trichlorophenol	ND		0.47	4.7
2,4,6-Trichlorophenol	ND		0.47	4.7
2,4-Dichlorophenol	ND		0.47	4.7
2,4-Dimethylphenol	ND		0.47	4.7
2,4-Dinitrophenol	ND		0.47	4.7
2,4-Dinitrotoluene	ND		0.47	4.7
2,6-Dinitrotoluene	ND		0.47	4.7
2-Chloronaphthalene	ND		0.47	4.7
2-Chlorophenol	ND		0.47	4.7
2-Methylnaphthalene	ND		0.047	0.94
2-Methylphenol	ND		0.47	4.7
2-Nitroaniline	ND		0.47	4.7
2-Nitrophenol	ND		0.47	4.7
3 & 4 Methylphenol	ND		0.47	4.7
3,3'-Dichlorobenzidine	ND		0.47	4.7
3-Nitroaniline	ND		0.47	4.7
4,6-Dinitro-2-methylphenol	ND		0.47	4.7
4-Bromophenyl phenyl ether	ND		0.47	4.7
4-Chloro-3-methylphenol	ND		0.47	4.7
4-Chloroaniline	ND		0.47	4.7
4-Chlorophenyl phenyl ether	ND		0.47	4.7
4-Nitroaniline	ND		0.47	4.7
4-Nitrophenol	ND		0.47	4.7
Acenaphthene	ND		0.047	0.94
Acenaphthylene	ND		0.047	0.28
Acetophenone	ND		0.47	4.7
Aniline	ND	UJ	0.47	4.7
Anthracene	ND		0.066	0.94
Atrazine	ND		0.47	4.7
Azobenzene	ND		0.47	4.7
Benzaldehyde	ND		0.47	4.7
Benzo[a]anthracene	ND		0.16	0.28
Benzo[a]pyrene	ND		0.097	0.19
Benzo[b]fluoranthene	ND		0.14	0.28
Benzo[g,h,i]perylene	ND		0.089	0.47
Benzo[k]fluoranthene	ND		0.16	0.28
Benzoic acid	ND		0.47	4.7
Benzophenone	ND		0.47	4.7
Benzyl alcohol	ND		0.47	9.4
Bis(2-chloroethoxy)methane	ND		0.47	4.7
Bis(2-chloroethyl)ether	ND		0.47	4.7

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Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Client Sample ID: OC-SW-EDSD/SW-7-XXX

Lab Sample ID: 360-41200-1
Client Matrix: Water

Date Sampled: 06/18/2012 1110
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Prep Method:	3510C	Prep Batch:	360-92116	Lab File ID:	B17814.D
Dilution:	1.0			Initial Weight/Volume:	1062 mL
Analysis Date:	06/20/2012 2015			Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1916			Injection Volume:	2 uL

Analyte	Result (ug/L)	Qualifier	MDL	RL
Bis(2-ethylhexyl) phthalate	ND		0.47	1.9
Butyl benzyl phthalate	ND		0.47	4.7
Caprolactam	ND	U	0.47	4.7
Carbazole	ND		0.47	4.7
Chrysene	ND		0.16	0.94
Dibenz(a,h)anthracene	ND		0.060	0.47
Dibenzofuran	ND		0.47	4.7
Diethyl phthalate	ND		0.47	4.7
Dimethyl phthalate	ND		0.47	4.7
Di-n-butyl phthalate	~~1.1~~ 4.7	~~J B~~ U	0.57	4.7
Di-n-octyl phthalate	ND		0.69	4.7
Fluoranthene	ND		0.19	0.94
Fluorene	ND		0.075	0.94
Hexachlorobenzene	ND		0.47	0.94
Hexachlorocyclopentadiene	ND		0.47	4.7
Hexachloroethane	ND		0.47	2.8
Indeno[1,2,3-cd]pyrene	ND		0.074	0.47
Isophorone	ND		0.47	4.7
N-Nitrosodi-n-propylamine	ND		0.47	4.7
N-Nitrosodiphenylamine	ND		0.47	4.7
Nitrobenzene	ND		0.47	4.7
Pentachlorophenol	ND		0.47	0.94
Phenanthrene	ND		0.080	0.19
Phenol	ND		0.47	4.7
Pyrene	ND		0.18	4.7
Phenyl ether	ND		0.47	4.7

Surrogate	%Rec	Qualifier	Acceptance Limits
2-Fluorophenol	30		15 - 110
Phenol-d5	19		15 - 110
Nitrobenzene-d5	75		30 - 130
2,4,6-Tribromophenol	95		15 - 110
Terphenyl-d14	94		30 - 130
2-Fluorobiphenyl	71		30 - 130

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Client: Olin Corporation

Job Number: 360-41200-1
Sdg Number: 360-41200-1

Client Sample ID: **OC-SW-EDSD/SW-7-XXX**

Lab Sample ID: 360-41200-1
Client Matrix: Water

Date Sampled: 06/18/2012 1110
Date Received: 06/19/2012 1000

8270D Semivolatile Organic Compounds (GC/MS) Low Level

Analysis Method:	8270D	Analysis Batch:	360-92162	Instrument ID:	Inst. B
Prep Method:	3510C	Prep Batch:	360-92116	Lab File ID:	B17814.D
Dilution:	1.0			Initial Weight/Volume:	1062 mL
Analysis Date:	06/20/2012 2015			Final Weight/Volume:	1.0 mL
Prep Date:	06/19/2012 1916			Injection Volume:	2 uL

Tentatively Identified Compounds **Number TIC's Found:** 10

Cas Number	Analyte	RT	Est. Result (ug/L)	Qualifier
	Unknown	1.74	58	~~T~~ J N
111-76-2	Ethanol, 2-butoxy-	5.81	0.67	~~T~~ J N
~~541-2-6~~	~~Cyclopentasiloxane, decamethyl-~~	~~8.31~~	~~1.1~~	~~T J N~~
~~540-97-6~~	~~Cyclohexasiloxane, dodecamethyl-~~	~~9.61~~	~~0.54~~	~~T J N~~
	Unknown	10.05	0.43	~~T~~ J N
100-23-2	Benzenamine, N,N-dimethyl-4-nitro-	12.44	1.2	~~T~~ J N
	Unknown	14.64	0.63	~~T~~ J N
	Unknown	14.67	1.5	~~T~~ J N
	Unknown	14.77	1.8	~~T~~ J N
	Unknown	15.38	1.6	~~T~~ J N

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